A proposal for a Design Approach to more Sustainable Business Models:

Tools, Process and Outcomes to Envision the Future of an Organization

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Abstract

A proposal for a Design Approach to more Sustainable Business Models:
Tools, Process and Outcomes to Envision the Future of an Organization
By Alexandre Joyce
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Stories of organizations transforming their business model is nothing new. At some point in time, any organization, big or small, reaches a crossroad where strategic thinking points towards reinvention. However, we argue that most business model changes are not specifically designed for environmental or social benefits but predominantly economic gains.

From our literature review, we determine that most research in the nascent field of sustainable business models is concerned with the ends of integrating a sustainability dimension to business models, however there is little empirical research on the means towards that transformation. Our research endeavour is constructivist and multidisciplinary and focuses on the convergence of design, management and sustainability. Our interest lies in the creative aspect of business model innovation when an organization conceptualizes future business models for sustainability. At that phase, we perceive a need for a structured design approach to more sustainable business models. Our research question is '**What could constitute a design approach to envisioning sustainable business models?**' We define a sustainable business model as the rationale of how a business creates, delivers and captures economic, environmental and social value. Our goal is to lay the foundations for the emerging practice of designing sustainable business models. We create a conceptual framework where we propose three inherent elements of a design approach: design tools, design process and design outcomes.

We justify each element of a design approach to more sustainable business models by reporting from our empirical fieldwork. By following an action based research methodology, we prepared 18 workshops with over 450 participants and 13 manufacturing companies to develop and validate our design approach. During this fieldwork, we created two design tools. The triple layered business model canvas tool that was born from a triple bottom line perspective expanding on the popular business model canvas. Twenty four business model pattern cards were also created to enhance the creativity of participants. For the design process element, we combined co-creation and design thinking processes to build on their strengths and answer for their weaknesses. Our third element focused on design

outcomes. We generated 5 cases which demonstrated the coherence of our design approach at three organizational levels: strategic, tactical and operational.

In this dissertation, we join all three elements of a design approach together to envision more sustainable business models. From this we learn how the design tools support a structure, the design process builds on experience and the design outcomes offer direction towards. We then conclude on how our design approach relates to three types of practitioners. First, we recognize the link between our design approach with the creativity and instinctual qualities of designers. Second, managers and entrepreneurs are well served by our design approach because their participation contributes to establishing a problem context before inviting them into an exploration space where they can embrace how the elements of a design approach favours learning. Lastly, because our design approach is applied at a system level of a business model, sustainability experts are empowered to conceive radical improvements with new forms of analysis concerning the sustainability of organization as a whole. That is why we see our design approach as the means to initiate change in organizations by providing a positive vision of what a sustainable business model can be. In the end, we contribute to research on business models for sustainability by exposing how a design approach can serve organizations in supporting the process, tools, and outcomes of their transformations. To conclude, we address how our design approach is relevant to the research fields we explored and its practitioners. We then comment on how this practice of designing sustainable business models will influence the next century's paradigm.

Keywords

Design, Design thinking, Business model innovation, sustainable business models, business models for sustainability, design approach, design tools, design process, design outcomes.

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Table of contents

List of figures

List of Tables

List of Abbreviations

IDP: Institute for Product Development
PROPD: Professional Participatory Design
PSS: Product-Service System
SBM: Sustainable business model
TLBMC: Triple layered business model canvas

Chapter 1. Introduction

In 1972, the Yvon Chouinard Climbing company began a transition of their business model. But they were not aware of it at the time. This small metal forging shop in Ventura California was faced with a business dilemma. They designed, manufactured and sold products to expert mountain climbers. The more they sold their forged steel climbing equipment, unfortunately, the more their clients hammered into the rock faces they cherished. This was clearly unsustainable for the rock face, for the climbers and ultimately for the business. They began manufacturing a removable climbing equipment, a hexagonal nut, that could be wedged into the existing cracks of the rock face and retrieved on the way down. Most importantly, using nuts left the rock face unaltered. In their yearly catalog, they wrote an essay to promote this technique they called “Clean climbing”. On one hand, their business model redesign reduced their sales of steel equipment by 70% (Griffiths and Elfman, 2012). On the other hand, they also diversified their offering to answer more needs of outdoors enthusiasts. That is how they ended up adapting their business model to become more sustainable in economic, environmental and social terms. Their success still grows today because they continue to stand behind values of responsibility and a philosophy of sustainability. Today, that company is called Patagonia and they are recognized as one of the world leaders in business sustainability according to the survey of GlobeScan and SustainAbility (2013).

Stories of transforming a business model is nothing new. Patagonia's story is one of change in the face of clear threats to their business model. IBM sold their computer manufacturing operations to focus on their consultancy services in the 1980's (Jetter et al., 2009). Xerox went from an industrial manufacturer of photocopiers to a document printing service provider in the 1990's (Chesbrough, 2010). The carpet

manufacturer Interface envisioned offering a more convenient flooring service in the late 90's (Olivia and Quinn, 2003). In retrospect, one thing all four of these organizational transformations - Patagonia, IBM, Xerox, Interface- have in common is that they happened to be improving towards sustainability when transforming their business model. However, we argue that most business model changes are not specifically designed for environmental or social benefits but predominantly economic gains.

Having designed early apple products and strongly influenced a young Steve Jobs, consider Esslinger's (2011) call to action. He argues emphatically for designers to play a role in creating business models for sustainability: *"Designers are especially well suited to implement and promote [the sustainability-driven business model]. Designers have a responsibility to connect and coordinate human needs and dreams with new opportunities and inspirations from science, technology, and business in order for products and their usage to be culturally relevant, economically productive, politically beneficial, and ecologically sustainable"*(Esslinger, 2011, p.401). We consider this appeal to be the first push for designers to play a significant role in improving sustainability not just in products but in the organization as a whole.

1.1 The problem: Sustainability for organizations

Understanding the impacts of an organization was in its infancy relative to manufacturing activities in the mid 90s (Graedel, 1997). Next, reducing the environmental impacts was explored by designing eco-efficient services (Brezet et al., 2001). In the figure 1 below, Brezet and Hamel (1997) illustrate four levels of improvements that have been identified to form an eco-efficiency hierarchy. The first level is for product improvements like increasing the efficiency of a car gas engine with a hybrid engine. The second level is product redesign where one can address the fit between the user and the object. To continue with a car example, a smaller 'Smart car for two' can be a more efficient for urban driving. Third, a

function innovation shows 10 times the improvement by changing the way towards an equivalent end goal. For example, a car sharing service changes the goal from owning a car to accessing a means of mobility. Fourth, at 20 times the efficiency (also known as Factor 20) a system's improvement transforms the entire relationships at stake. To continue on our example, cars might not even be part of the transport system if urban design alone can influence mobility for the masses. According to Charter and Tischner (2001) this last level of system innovation is considered to be in line with a sustainable level placed at Factor 20.

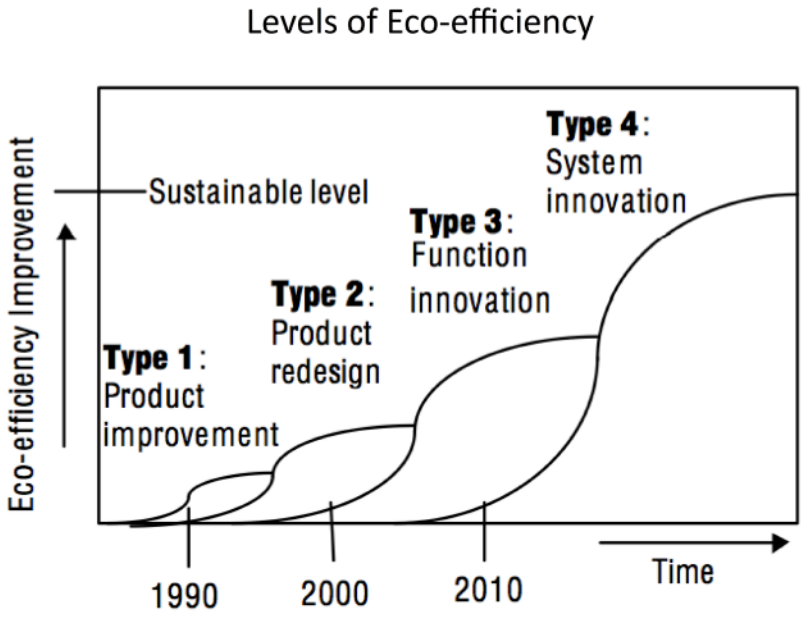

Figure 1. Four levels of improvements have been identified to form an eco-efficiency hierarchy. Reproduced from Brezet (1997)

Ultimately, this graph turns out to be more of an illustration or a diagram then a statistically proven model. It serves to explain the varying reach and potential transformation from a product or its system. On the X axis of time, it is assumed that it's easier to create better products and process redesigns than

whole systems changes, including the establishment of new cultures and infrastructures. On the Y axis, the actual correspondence to differentiated factors of environmental benefits remains a theory to be demonstrated in empirical research. When it comes to the environmental benefits of eco-efficient services concepts, Brezet's early evidence seems to support mainly 'modest' claims for improvement. However, it might have been too hasty to dismiss the potential of a transformation from products to services on the basis of early evidence (Heiskanen and Jalas, 2003).

A second wave ensued for improving the impacts of organizations and the consumption they enable. Researchers around the world have been studying Product-Service Systems (PSS) in Europe (Mont, 2002) or Servicizing in the United States of America (White et al., 1999). Manzini et al. (2001, p.13) defined the notion of product-service system as: *"An innovation strategy, shifting the business focus from designing (and selling) physical products only, to designing (and selling) a system of products and services which are jointly capable of fulfilling specific client demands".* From an environmental point of view, product-service systems generated great promise in drastically reducing environmental impacts in terms of material consumption (Heiskanen and Jalas, 2003; Kerr and Ryan, 2001). While referring to Brezet's diagram above, we can cite examples of system innovation (type 4) such as car sharing services, leasing hi-end photocopiers or power tool rentals. These types of offerings have generated theoretical hopes that product-service systems (PSS) can respond to the challenge of decoupling the impacts of industrial consumption and production with the current economic system. In the timespan of a decade, product-service systems have been thoroughly discussed among academics and industries with regard to their potential for high sustainability levels (Tukker and Tischner, 2006a).

We study product-service systems as a specific type of a business model (Barquet et al., 2011, 2012;

Ostaeyen et al., 2011; Wallin et al., 2013). In fact, the early definition by Goedkoop (1999) had described a PSS as an improved business model: "*a PSS is a system of products, services, networks of players and supporting infrastructure that continuously strives to be competitive, satisfy customer needs and have a lower environmental impact than traditional business models*". Some advanced forms of product-service systems are considered function oriented business models. For example, Rolls-Royce provides jet engines in a power by the hour service and Michelin provides tire solutions by the kilometer in service contracts. These models differ from traditional industrial business models as they deter growth imperatives required by selling more consumption of products. Instead, function based business models gain from efficiently providing a service with a convenient access to a controlled amount of resources. Researchers exposed a theoretical and qualitative argumentation for the benefits of such business models in the form of dematerialization (Manzini and Vezzoli, 2003).

According to Tukker and Tischner (2006), a product-service systems is not intrinsically sustainable. There are also cases in which product-service systems cause higher environmental impacts than a traditional system. For instance, it could be possible to increase impacts when renting physical products from travelling back and forth to a retail store. Before going further, we must reiterate the warning that was affirmed early on by White et al. (1999): "*It is clear that there can be no general assumption that services are inherently environmentally superior to products*". Although having certain business and environmental potential, current examples of product-service systems often lack sufficient evidence about their environmental superiority as compared to traditional business models (Mont and Lindhvist,2003). Inversely, the majority of authors whom expose the results of new product-service systems emphasize the benefits on an environmental and social dimensions over demonstrating the economical successes of this business model (Baines et al., 2007).

When reviewing how the subject of product-service systems evolved, Mont and Tukker (2006) noted a lack of guidance on how to develop systems that are environmentally sound: "*What is needed is a comprehensive understanding of factors that affect choices of companies with regard to developing products and services in an environmentally sound manner and with a holistic perspective in mind.*"(p.1453) According to Kang and Wimmer (2008), *"a product-service system, if designed properly, can effectively contribute to achieving the sustainability goal of decoupling value creation and resource consumption*"(p.191). Our research begins by acknowledging that environmental and social benefits are not automatic in business models such as product-service systems. We are sensitive to the calls from the sustainability experts we quoted above that PSS business models need to be the fruit of a designed effort.

The expression "if designed properly" used by the authors is of great interest to this research. It is unclear if they mean that the design process should result in the goals it pursues such as greater sustainability. And in contrast, that would mean that some design efforts do not lead to the expected outcomes. So we begin to wonder what does "*designed properly*" mean? Herbert Simon provided a starting point when defining design. He stated that everyone who designs "devises courses of actions aimed at changing *existing situations into preferred one*" (Simon, 1969, p.5). Moreover, Shamiyeh (2010) describes design as enabling a systems approach. He states that an organizational "change process may be 'facilitated' rather than 'managed' in a holistic world-view using the elements - architecture, design and tools - each representing an intervention in itself when applied to organization development. (p.97)".

From the conclusions of these researchers, we see promise in researching how design can be used to address the sustainability of business models. Our research question is "**What could constitute a design approach to envisioning sustainable business models?**" Before focusing on the role of a design

approach to sustainable business models in the following chapter, we first look at how organizations have been tackling sustainability so far.

When speaking of sustainability in general, many refer to the Bruntland et al. (1987) definition of sustainable development stated as *"meeting the needs of the present without compromising the ability of future generations to meet their own needs"*. A few years later, a distinction was made by Daly (1995, p.9) that sustainable development is: *"development without growth beyond environmental limits"*. Another understanding of sustainability they described was seeking a balance between economic, environmental and social dimensions. Then came the idea presented by Daly et al. (1995) that these three concepts should be seen as concentric and thus embedded, by bounding economics within limits of the environment, as is represented in figure 2. This understanding of the planet as a finite resources started the field of Ecological Economics. Gendron (2006) went one step further by orienting these elements. She states that society is the end goal, where as the economy is a means to create exchanges, and the environment represents the physical limit of our finite planet.

Embedded View of Sustainability

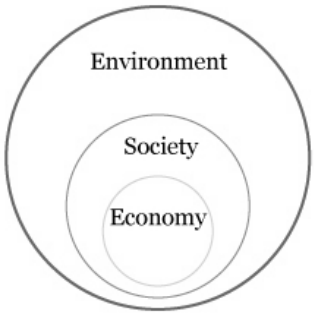

Figure 2. Economic, environmental and social dimensions should be seen as concentric and thus embedded. (Daly, 1995)

Brown and Garver (2009) have proposed a different understanding where sustainability is not an end in itself, rather a means to create the right relationships amongst all living and non-living beings of the Earth. Moreover, this ethical notion of a "right" relationship is defined as tending "*to preserve the integrity, resilience, and beauty of the commonwealth of life*"(p.5). They interpret sustainability as the right relationships for the whole earth.

As we have seen so far there is a plethora of approaches to sustainability. Here, we need emphasize the nuance that sustainability is a relative and not an absolute quest for improvement. That is why we seek to make business models *more* sustainable and we would be hard pressed to guarantee a sustainable business model in absolute terms.

Our interest in sustainability originates from a business and organizational setting. For example in a corporate approach to sustainability, one of the first means to influence business decisions has been with Elkington's idea of the triple bottom line (1994). This means adding to financial accounts other performance indicators that keep track of social and environmental benefits and impacts. This triple bottom line is by no means a perfect solution to the complex problem of sustainability. Many have criticized it for simplifying (Mitchell, 2007; Norman and MacDonald, 2004; Vanclay, 2004).

On another front, organizations are not transforming at the level required to face the problems coming from our current economic, environmental and social systems (Pain, 2015). The complex systems pioneer, Edgar Morin, put is this way: *"The system Earth is incapable of organizing itself to treat its vital problems: nuclear perils grow with the potential privatization of an atomic weapon, biosphere*

degradation continues, the world's economy is without true regulation, there is a return of famines, ethno-politico-religious conflicts tend towards wars of civilizations." (author translated)(Morin, 2010). Paquin and Shrivastava (2011) have exposed the multiple crises -societal, environmental, economic and individual- we are facing in the 21st century. As described by Shrivastava and Paquin (2011), "w*e are living in an emerging crisis society. Crisis here means a condition where systems that produce value breakdown in structure and process; and are accompanied by large damages and harm to stakeholders."* The authors finish by sharing a positive vision of a sustainable enterprise as one that fully accounts for business impacts. They ask large questions like: *"How can we engage in business competition in ways that improve our natural and societal ecosystems?"* (p.17) From here on out, we too consider the challenge of sustainability as requiring a systems perspective where the whole is greater than the sum of its parts.

In Ehrenfeld's book entitled "Sustainability by design" (2009), he strongly criticizes current approaches to sustainability. "*Almost everything being done in the name of sustainable development addresses and attempts to reduce unsustainability. But reducing unsustainability, although critical, does not and will not create sustainability.*" (p.7) He defines sustainability broadly as "*the possibility that human and other life flourish on the planet forever*" (p.6) He sees much opportunity in design as a different way to approach problems by guiding behavior toward ethical responsibility and allowing for evolution in time. We relate to the vision of Ehrenfled in that we too point to design as a means for improving towards sustainability.

More practically, McDonough and Braungart (2002) propose for a sustainable industrial system guided by new design perspective where a triple top line allows for "*products to enhance the well being of*

nature and culture while generating economic value"(p.251). We follow in their approach, however we see an opportunity to transform not only the product at the operational level of the organization but its services at tactical level and more importantly its business model at the strategic level. Moreover, according to Zott and Amit (2010) working with business models enables a systems perspective. We see this as a requirement to address the larger sustainability problems Morin exposed earlier. Yet, by no means, are we proposing that sustainable business models can solve all society's systemic problems. We do focus on sustainable business models because they are part of the solution. Many reports relate the lack of knowledge of the simple existence of these new types of business models (Birkin et al., 2009) (EU Commission – DG Environment, 2008), let alone the existence of design methods to undertake this radical transition.

No matter how an organization approaches the sustainable paradigm, we argue for a deeper analysis of its purpose so it can contribute positively towards the future of society, the planet and itself. For this to happen, Nidumolu et al. (2009) demonstrate that improving towards sustainability means a change in the organization's business model. In the quest to integrate sustainability into innovation management, the authors empirically documented how thirty organizations move through five stages in transforming towards sustainability. This research team documented the five stages in facing the challenge, changes and opportunities that arise from sustainability. Ultimately, the authors argue that sustainability has now become the key driver of innovation and not simply the reverse:

> *"Executives behave as though they have to choose between the largely social benefits of developing sustainable products or processes and the financial*

costs of doing so. But that's simply not true. We've been studying the sustainability initiatives of 30 large corporations for some time. Our research shows that sustainability is a mother lode of organizational and technological innovations that yield both bottom-line and top-line results." (p.3)

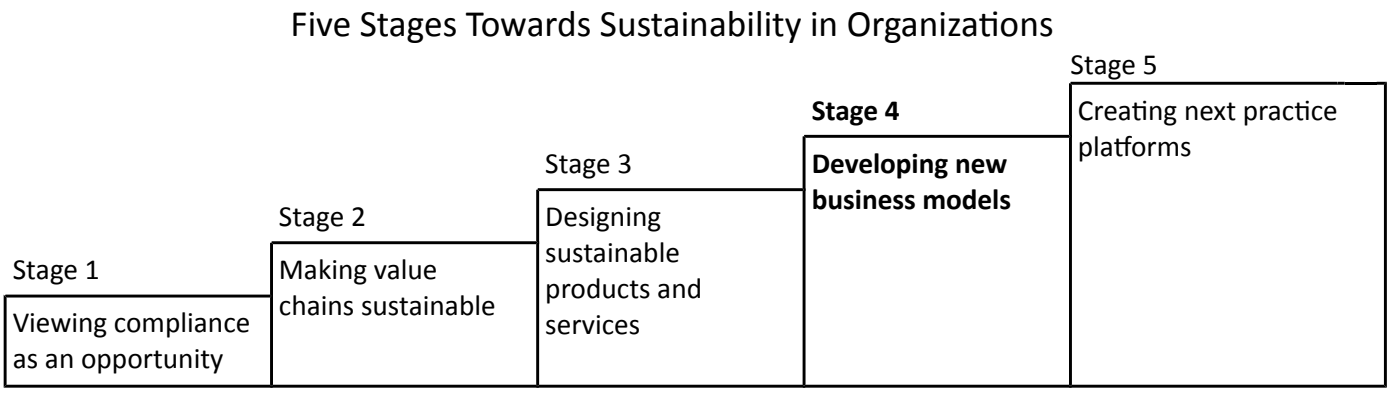

Figure 3. There are five stages for organizations to face the challenge, changes and opportunities that arise from sustainability. Reproduced from Nidumolu, Pralahad and Rangaswami (2009)

We view the model proposed by Nidumolu et al. favourably because it fragments the transition towards a more sustainable organization into steps with reference points. We wish to position our present research as a means to move from level three, product and service innovation, to level four, business models. Nidomolu et al. speak of a designing sustainable products and services in the third level and we contend that a similar design approach should lead the way to a developing new business models for sustainability. The authors do describe the central challenge of the 4th stage as *"to find new ways of delivering and capturing value, which will change the basis of competition." (p.9)* Finally, the authors are convincing when advocating for sustainable innovation to include sustainable business models, although it is not mentioned what makes a business model more or less sustainable. In addition, we find the

authors describe their sample mostly in terms of the end goal that are sustainable business models and not the means such as the method or the approach. This is the main gap we will explore in this budding field of research on sustainable business models. Little light has been shed on how to lead the creative aspect of the transformation of a business models for sustainability.

In the previous section, we reviewed how sustainability can be applied to organizations. The authors we reviewed above agree that sustainability is systems problem and thus to apply it to organizations requires a systems perspective. Because a business model is a system's view on the organization (Amit & Zott, 2010), we now circumscribe our all our research efforts within this emerging field of sustainable business models (SBM).

1.2 The ends: a review of sustainable business models.

Having reviewed the wider research on sustainability for organizations, we now focus on the smaller field of sustainable business models (SBM). We chose to avoid confusion by not using the equivalent term business models for sustainability (BMfS) which has also been used to describe this field of research (Boons and Lüdeke-Freund, 2013). In the following literature review, we will show how current research has questioned sustainable business models as an ends. Inversely, little has been written about how to arrive at those ends.

If we had to create a starting point when retracing the genesis of the concept of a sustainable business model, we look to Stubbs and Cocklin's (2008) seminal article. They initiated a description of the characteristics of what makes a business model potentially sustainable. They cite the works of Wicks (1996) to describe the effect of sustainability on a firm's business model as playing *"an integral role in*

shaping the mission or driving force of the firm and its decision making" (p.104). They research the idea of a sustainable business model but they remain very broad on the potential application in practice. They refer to a combination of features, conditions, processes and/or narratives. Nevertheless, Stubbs and Cocklin did address the problems with the "neoclassical economic worldview" of organizations by establishing a few principles of a sustainable business model. The authors' main contribution is their definition of a sustainable business model (SBM) in the following 6 principles:

Six principles of a Sustainable business model (SBM)

1.	A SBM draws on economic, environmental and social aspects of sustainability in defining an organization's purpose
2.	A SBM uses a Triple Bottom Line approach in measuring performance
3.	A SBM considers the needs of all stakeholders rather than giving priority to shareholders' expectations
4.	A SBM treats nature as a stakeholder and promotes environmental stewardship
5.	Sustainability leaders drive the cultural and structural changes necessary to implement sustainability
6.	An SBM encompasses the systems perspective as well as the firm-level perspective

Table 1. The characteristics of what makes a business model sustainable. (Stubbs and Cocklin, 2008)

Another approach was that of Lüdeke-Freund (2009) who took the broad areas of a business models and instilled a notion of sustainability. This results in a definition closer to Osterwalder and Pigneur's business model canvas : "*A business model for sustainability is the activity system of a firm which allocates resources and coordinates activities in a value creation process which overcomes the public/private benefit discrepancy. That is, a business model for sustainability is the structural template of a business logic which creates the business case for sustainability.*" *(p.43)*

Other researchers followed their work referring to “sustainability business models” or even “business models for sustainability”. Hansen et al. (2009) describe sustainable business models as a different approach to innovation, traditionally based on improving the efficiency of technology. They studied product-service systems such as a car-sharing business where the business model influences consumption patterns. The link between business models and business cases to advance sustainability management has been explored by Schaltegger et al. (2012). They find that incremental improvements of processes can be implemented within the existing business model, but more radical transformations may require changes to its components or even an entire new business model all together.

Still in the quest to conceptualize a sustainable business model, Boons and Lüdeke-Freund (2013), embarked on an in-depth literature review. They end up proposing 4 basic requirements for each of the constituting elements of business models: (1) the value proposition must provide both ecological/social and economic value through offering products and services, (2) the infrastructure must be rooted in principles of sustainable supply chain management, (3) the customer interface must enable close relationships with customers and other stakeholders to be able to take responsibility for and manage broader production and consumption systems (instead of simply selling stuff) and (4) the financial model should distribute economic costs and benefits among actors involved.

Starting from the sustainable innovation field, Boons & Lüdeke-Freund (2013) and Verhulst & Boks (2012a) move towards the field of business models. The first team of authors reviewed the literature in both fields and found three dimensions to sustainable business model: through technological innovation, organizational innovation and social innovation. The second team of authors undertook a longitudinal and empirical study of the evolution of practice from sustainable product design to sustainable business

models. They find that more sustainable outcomes arise from the implementation of strategies from the development of new business models. However, we notice a gap in research when it comes to an empirical account or a practical approach to the design of a business model for sustainability.

From this literature review on the field of sustainable business models, we see that there has been much emphasis on defining the concept from its founding principles to distinguishing how it applies to organizations. In our view, most research is concerned with *the ends* of integrating a sustainability dimension to business models (Boons and Lüdeke-Freund, 2013; Stubbs and Cocklin, 2008; Upward, 2013; Verhulst and Boks, 2012b).

The first to point out how there is little empirical research on *the means* of transforming existing business models towards sustainability was Sommer (2012). He dedicated his doctoral dissertation to studying the management of green business model transformations. He did so by balancing an applied and theoretical approach and he emphasized the organizational change process. Although, the term "green" limits the research to only to the environmental aspect of sustainability, his study did focus on a management approach to business model transitions of incumbent firms. In contrast, our angle of research narrows to that which precedes the management of a transition. Our research specifically studies the creation of a vision for sustainable business models.

Recently some research efforts, mostly focused on tools, have begun moving into the means of changing towards more sustainable business models. Upward's (2013) masters thesis critiques the profit centred aspect of a business model and emphasizes strong vs weak sustainability (Neumayer, 2003). First, he addresses the need for defining the concept of a strongly sustainable business model and second he

proposes a canvas tool to illustrate business models as strongly sustainable. He considers his ontological goals combined with a canvas tool as a systems approach. Other researchers have been working at making tools to demonstrate how sustainable business models change the notion of value within organizations and they have been mapping how an organization can "*create balanced social, environmental and economic value through integrating sustainability more fully into the core of their business*" (Bocken et al., 2013; p.175). Our goals for this research are very much aligned but we do not focus on mapping value. Their circular tool ranges types of values (purpose, captured, destroyed, opportunities) with respect to four different stakeholder groups (Environment, Customers, Society and Network actors). Our research endeavour is distinct from Sommer's management approach, Upwards strong sustainability approach and Bocken's value mapping approach. To study the means, we propose a design approach to imagining and creating a vision of a more sustainable future.

In our endeavour to initiate the transformation of organizations towards a more sustainable business model, we raise Elkinton's idea of the triple bottom line (1994) at the business model level. Our definition of a more sustainable business model is therefore inspired both by the triple bottom line approach and by adapting Osterwalder's definition of a business model. **Our definition of a sustainable business model is "*the means of how a business creates, delivers and captures economic, environmental and social value ".***

In this introductory chapter, we have reaffirmed the various pleas from sustainability designers such as Esslinger and McDounough, from sustainability researchers like Mont, Wimmer and Tukker, and business researchers like Nidumolu and Prahalad. Although they all begin from different disciplines with different language and arguments, we interpret their pleas as seeking a common goal. They call for change

towards sustainable business models. We see design as the means to that end. For instance, to answer our research question "**What could constitute a design approach to envisioning sustainable business models?",** we examine how designing visions of future business models along with service scenarios and innovative products can inspire organizations towards a transformation in the face of growing regional and global economic, environmental, and social crises (Shrivastava & Paquin, 2011). In response to these interdisciplinary challenges, our goal is to lay the foundations for an emerging practice of applying a design approach to envision new business models for sustainability.

Our research goals are of a practical and conceptual nature. They do not align with a positivist epistemology where results are objectively validated as true within a specific field of research (Guba and Lincoln, 1994). In contrast, this research unites intersections of design, management and sustainability through a trans-disciplinary project. Furthermore, this research on organizations was developed within a constructivist paradigm and design science methods as described by Avenier (2010). Consequently, the design researcher's subjectivity influences how findings are created through 'reflexive practice' (Schön, 1987) or through 'designerly ways of knowing' (Cross, 2001). Specifically, we strived for our research to generate knowledge by empirically developing and testing our design approach to envisioning sustainable business models. In order to report on the methods and the artifacts we created, we follow the guide proposed by Gregor and Hevner (2013) to presenting design science research in table 2 below.

Publication schema for a design science research study

Section	Contents
1. Introduction	*Problem definition, problem significance/motivation, introduction to key concepts, research questions/objectives, scope of study, overview of methods and findings, theoretical and practical significance, structure of remainder of paper.* For design science research, the contents are similar, but the problem definition and research objectives should specify the goals that are required of the artifact to be developed.
2. Literature review	*Prior work that is relevant to the study, including theories, empirical research studies and findings/reports from practice.* For design science research work, the prior literature surveyed should include any prior design theory/knowledge relating to the class of problems to be addressed, including artifacts that have already been developed to solve similar problems.
3. Method	*The research approach that was employed.* For design science research work, the specific design science research approach adopted should be explained with reference to existing authorities.
4. Artifact description	A concise description of the artifact at the appropriate level of abstraction to make a new contribution to the knowledge base. This section (or sections) should occupy the major part of the paper. The format is likely to be variable but should include at least the description of the designed artifact and, perhaps, the design search process.
5. Evaluation	Evidence that the artifact is useful. The artifact is evaluated to demonstrate its worth with evidence addressing criteria such as validity, utility, quality, and efficacy.
6. Discussion	*Interpretation of the results: what the results mean and how they relate back to the objectives stated in the Introduction section. Can include: summary of what was learned, comparison with prior work, limitations, theoretical significance, practical significance, and areas requiring further work.* Research contributions are highlighted and the broad implications of the paper's results to research and practice are discussed.
7. Conclusions	Concluding paragraphs that restate the important findings of the work. Restates the main ideas in the contribution and why they are important.

Table 2. This dissertation follows the structure proposed by Gregor and Hevner (2013) for design science research.

This dissertation is structured in the following manner. In this first chapter we have begun reviewing the literature on sustainability for organizations (as the problem) and sustainable business models (as the

ends of this research). In the second chapter, we build on a literature review to build a conceptual framework for a design approach (as the means) through which we study sustainable business models. We continue the literature review of past and present research theory where design and management converge (as the context). This helps build the foundations upon which we answer our research question by proposing three elements that could constitute a design approach: design tools (1) used within a design process (2) to arrive at the specific design outcomes (3) of more sustainable business models. The third chapter is dedicated to the action research methods we followed to construct the various tools and workshops to design a vision for sustainable business models. In Gregor and Hevner's approach, chapter four describes the artifacts created during field work and the fifth chapter centres on the evaluation of the artifact. Because we have many artifacts to describe, we choose to combine the description with the evaluation in short succession. Therefore our fourth chapter is dedicated to describe and evaluate the artifacts. In particular, we share the Triple Layered business model canvas tool, the business model pattern cards and the business model concepts for the 5 cases. Still in the fourth chapter, these concepts are evaluated to make sure they respond to the principles of sustainable business models. Also, we present participant feedback concerning their experience of our design approach. The fifth chapter discusses the main findings with regards to our design approach to sustainable business models. In this discussion, we expand on the strengths and weaknesses of the design tools we crafted and of the dual design process of co-creation and design thinking. We also state how our three elements for a design approach contribute to research and outline the limits to our study. We conclude by relating how a design approach progresses with regards its the founding research fields as well as how this approach can influence practitioners in those fields such as designers, managers and sustainability experts. We conclude by sharing our hopes to witness how sustainable business models can transform the 20th century industrial system into a sustainability paradigm of the 21st century.

Chapter 2. Conceptual Framework to a design approach

For this chapter, our objective is to step back from the problem (the "why") and the ends of the research (the "what") to better focus on the means (the "how"). We wish to define design as the approach by which we can arrive to our goal which is more sustainable business models. First of all, we wish to ground our research by reviewing the literature on past and present theory concerning a design approach. Therefore, we begin to review the broader context where some management research threads are converging with design research. Secondly, we define what is a design approach for organizations. Third, we go in depth as to what constitutes a design approach to understand the means by which we can arrive at sustainable business models. Fourth, we propose three inherent elements of a design approach which are its tools, process and outcomes. Our contention is that these three elements represent a theoretical framework to what constitute a design approach to sustainable business models.

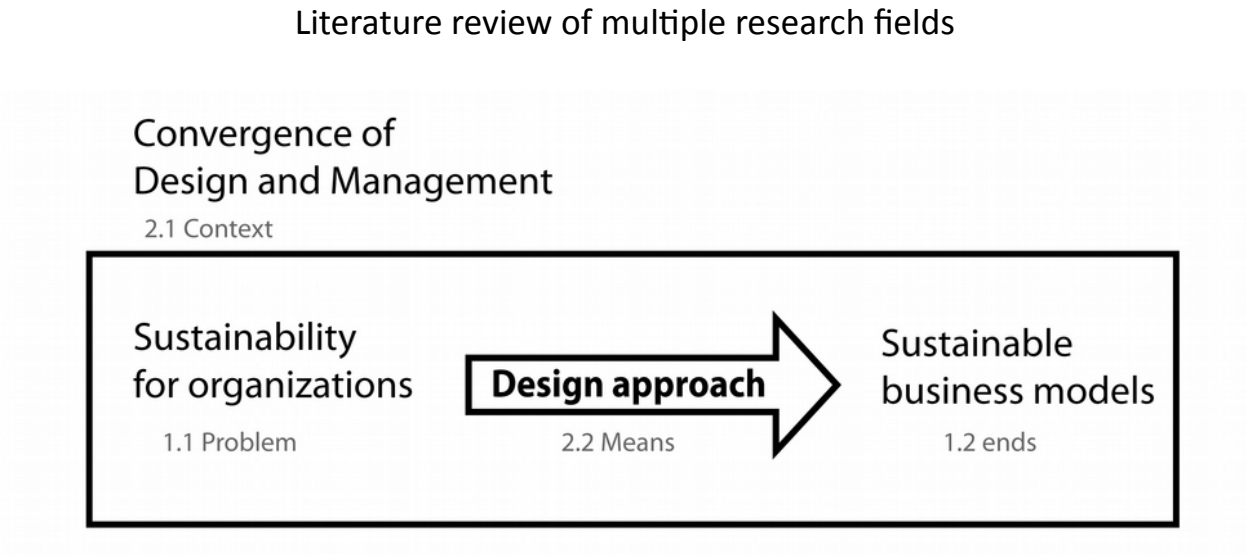

Figure 4. The literature review for this research unites multiple fields of research

2.1 The context: a review of design and management

The action of designing an organization is not new, and has been first discussed as form of strategic management (Galbraith, 1973). Later, it has been described in the works of Galbraith in terms of information systems (1977) and later in terms of innovation (1982). This section develops the context behind the conceptual framework of a design approach. First we track back and review the origins of management research and design research. Second, we assess the progression of both fields by offering short descriptions of many different influences that broaden our understanding of each field. The following figure 5 serves as a guide for this section as it highlights an author that marked the time period for each step of the convergence. This diagram illustrates how design and management have now intersected. This results from the arrival of design thinking which seeks to influence the way managers go about their business. This collision gives a new meaning to the phrase organization design and we speculate a potential 2nd generation.

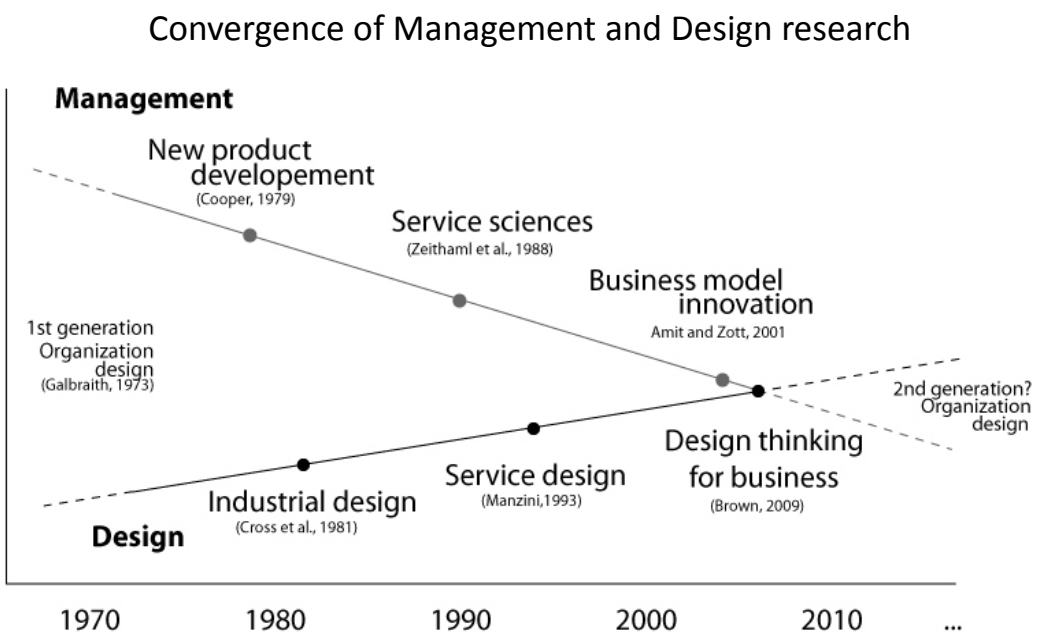

Figure 5. The underlying context of our theoretical framework is the convergence of the fields of management and design research.

Management research. Unlike physics or chemistry which are descriptive sciences, management can be a studied with a normative approach because it prescribes a form of practice. Management research began with the quest for the *best way* led by Taylor's scientific organization of work. We find evidence of this quest in Thompson's (1914) writings, where scientific management research was applied to industrial activities. This refinement of practice is still present in assembly line audits as we know them today. As the economy of developed nations shifts away from relying on industrial manufacturing, management research has evolved to cater new areas of research. Today, management research has branched out into many fields. Contemporary organizational theory has adapted by studying networks, conventions, power and other themes almost removed from practical managerial implications (McKinley, 2010). In the case of this action research, we choose to bring back a sense of practical output to the management research by better understanding its growing relationship with organizational transformations.

Design research. The idea of design research can be retraced to the 1962 conference at the Imperial college of London called "Design methods". The evolution of design research, from design methods, to first and second generations to scientific research in design, has been very well documented by Bayazit (2004). He points to Archer's (1981) definition of design research as "*Design research is systematic inquiry whose goal is knowledge of, or in, the embodiment of configuration, composition, structure, purpose, value, and meaning in man-made things and systems.*" There have been many debates about the nature of design research (Buchanan, 2007; Frankel and Racine, 2010; Roth, 1999). On one hand, some believe the goal of design research is to learn more about a situation in order to identify and help solve new problems (Zeisel, 1984). On the other hand, some see value in researching the very nature of

the design activity (Dorst, 2008; Findeli, 1995). Frankel and Racine (2010) clarify three types of design research and their objectives in detail. They establish three distinct approaches a) clinical - research for design, b) applied - research through design and c) basic - research about design. We use this framework to position our research as clinical because our goal is to explore how a design approach can guide organizations towards imagining more sustainable business models. Further in this chapter, we will discuss in greater detail our clinical approach and how it stems from research on the design process.

New product development. The field of new product development is born from the will of manufacturers to manage their future product offerings with success and avoid failures (Cooper, 1979). New product development is the management of the process that bring ideas to market in what is called a product (Cooper, 1983). A product is defined as a set of benefits, most often tangible, offered for exchange. This process involves marketing to translate the demand and for engineering to produce an offering (Souder, 1988). The new product development process thus combines these two potentially conflicting activities into distinct development phases. The Stage-Gate process, for example, facilitates multidisciplinary teamwork (Cooper, 1990). From the perspective of management, a new product developement strategy has been described as consisting of four dimensions: (a) cost (b) quality (superior products) (c) dependability of supply and (d) flexibility in product variations (Wheelwright and Clark, 1992). In all, new product development is itself a form of transition, at a smaller scale, where management prepares the change towards new products.

Industrial Design. As the new product development field grew, industrial design was still a rather young field of research (Cross et al., 1981). Most can agree that it started with the Bauhaus model in the 1920s and spread with the industrialization movement that came with World War II. A french ex-patriot,

Raymond Loewy, is often considered to be the first industrial designer. He seduced large american corporations with his approach to design which is encapsulated by the title of his book “Never leave well enough alone”(Loewy, 1963).

In the very beginning, the activity of design was understood as mostly an effort of styling (Read and Read, 1966). Then came the application of Sullivan's (1896) “*form follows function*” philosophy, where the design process was striving for a rational approach to create products. This became the starting point of functionalism. The goal of design was to reify the function which would then suggest a choice in materials which in turn would determine a proper shape (Heskett, 1980).

Today, product design can be summed up as the activity that consists of creating material goods in order to answer the needs of users (Hekkert and Schifferstein, 2008). The process begins by gathering information about the user’s needs, object’s requirements and the context’s constraints of the design situation. By inventively remixing together ideas, drawings, and information, the product design process repeats cycles of problem solving efforts. This leads to a progression in transforming the input information into the output design. The design evolves in a process that is stepwise, iterative and recursive where each step achieves a measure of progress on a portion of the problem and its proposed solution. The process formally ends when the production of the solution is complete.

Service sciences. In the 1970s, management researchers began pointing to the predominance of services in the market and the void in research on the subject. This gave way to the field of service sciences. Among the first to populate the field was Theodore Levitt at Harvard. It is said that he would try to convince his students that “*people don't want to buy a quarter-inch drill, they want a quarter-inch hole*”.

He later wrote a paper in 1976 entitled *"The Industrialization of services"* where the main idea was to approach services with the same processes with which products are developed, scaled and commercialized (Levitt, 1976). Soon thereafter, Shostack (1977) proposed a different, almost opposite, view. When commercializing a new offering, she suggests to market the tangible aspects of a service and inversely, the intangible aspects of a product. In retrospect, her contribution was to make explicit the continuum, from tangible to intangible, that can nuance products from services.

According to Hill (1977) a service is "*a change in the condition of a person, or a good belonging to some economic entity, brought about as the result of the activity of some other economic entity, with the approval of the first person or economic entity*." Near the end of the 80s, the distinction between products and services was made clear with four distinctions: intangibility, perishability, simultaneity and heterogeneity (Zeithaml et al., 1988).

There have been arguments for insuring that service science remains a multi-disciplinary field or even transdisciplinary (Glushko, 2008). As of today, service science still remains rather undefined as a field. Hope comes from growing the interdisciplinary effort around a common set of problems (Chesbrough and Spohrer, 2006). Although, one could argue that marketing has shown most interest in bridging the gap. In parallel, design research has also manifested much interest in what has become service design.

Service design. Hollins and Hollins (1991) describe service design as both the design of what is tangible and intangible. *"It can involve artefacts and other things including communication, environment and behaviours. Whichever form it takes it must be consistent, easy to use and be strategically applied"* (p.16). Taking into account multiple parts as a whole leads us to the design of services in holistic terms.

With a systems perspective, the elements of a customer's experience such as infrastructures, relationships and artifacts can be designed as a whole. This holistic approach to designing services follows the evolution of user-centered design. In the early writings of Papanek (1972), there was a debate as to wether the designer works within the confines of the manufacturing capacity or he works to answer the users' needs. This debate lasted until the end of the 1980s, when an industrial design firm by the name of IDEO began promoting a different take on the design process. More precisely, the objective of design was to create products for the human users. Later Norman (2002a) argued for redefining the goal of product design to first and foremost cater to the needs of the users. This philosophy is now referred to as user-centred design (Säde, 2001).

From Manzini's (1993) point of view on design, there was an attempt to differentiate service design from other fields. By putting the user at the centre of the design activity, industrial designers begin to look beyond the function of the object and concentrate on the overall outcome referred to as the user experience (Findeli and Bousbaci, 2005). The design process remains a quest for adapting the form to the function, but this goes past the confines of the product by taking into account the relationships that users live. With this broader view on the design activity itself and with a sensibility for the user experience, the scope of design has opened to address more than tangible products in what has become service design.

Today, service design has generated interest both in research literature and in practice. The leading UK firm in the field, Live|Work, define service design as "*the application of an established design process and skills to the development of services. It is a creative and practical way to improve existing services and innovate new ones*"(in Canducci et al., 2015, p.11). Another piece of the puzzle to understand

service design is to infuse design methods with other fields of practice. In their seminal book called *This is service design thinking*, Stickdorn & Schneider (2012) devote a section for each disciplinary approach within service design: product design, graphic design, interaction design, social design, strategic management, operations management and design ethnography. This inter-disciplinary approach puts even more importance on the process of design and the relationship between the user and the service than simply on the tangible outcomes.

Business model innovation. Moving into the strategic aspects of an organization, the service is delivered within a business model. The term business model, in popular speak, has often been reduced to a revenue model, which is the way an organization generates revenue. The distinction between revenue model and business model comes from a larger understanding of the creation of value by an organization. Therefore a business model includes the notion of service, a financial dimension and the creation of value. But what is a business model exactly?

The "*theory of a business*" is an old way of referring to a business model employed by Drucker (1994). Since the early 2000s, a growing field of research has been devoted to the study of business models. Zott & Amit (2011) revisited the past literature to compare and contrast the different definition of a business model. This research duo have been paving the way for business model research. They define a business model as: *"The content, the structure, and the governance of transactions designed to create value through the exploitation of business opportunities" (Amit & Zott, 2001).*

In their field review article of 2011, they change their focus from studying the what to the how. They highlight business model innovation as an alternative for general managers and entrepreneurs to create

new value, specifically in times of economic change. They also refer to an often cited definition of a business model provided by Teece (2010; p.172), when he states that "*a business model defines the manner by which the enterprise delivers value to customers, entices customers to pay for value, and converts those payments to profit*". According to Teece, the notion of the business model often remains tacit for organizations. In other words, the organization operates without consciousness of its own operating system. This makes the task of improving upon something that is intangible and implicit very challenging.

As is often the case with new approaches, a prominent figure personifies the field. The main proponent of business models innovation is without a doubt Alex Osterwalder. His doctoral dissertation (2004) also combed through existing definitions and ended up describing a business model as an abstract conceptual model that represents the logic of how a business creates relationships. Also, Osterwalder situates the business model in a layer between business strategy and processes. A synthetic definition is found in his subsequent bestseller *Business model generation* (Osterwalder and Pigneur, 2010) where they state that "*A business model describes the rationale of how an organization creates, delivers and captures value*."(p.14) Moreover, the widespread application of the tools in Osterwalder and Pigneur's book has crystallized which elements can best describe a business model. The authors determined nine building blocks as the parts that make up the whole in what is called the business model canvas. We will go over the canvas and its components in detail when presenting the foundation of our design tools. For now, we acknowledge that some criticism has surfaced regarding Pigneur and Osterwalder's condensed description of a business model into a nine box canvas because of its usefulness. For example, the business model canvas comes from an innovation bias, and doesn't account for other aspects of managing an organization, such as corporate structure, business objectives, performance

measurements, strategy management and competition analysis (Rosenberg et al., 2011). To that list, we care to add that it does not speak for environmental and social responsibility in creating multiple forms of value. This is to be considered the ethical shortcoming of the business model canvas and thus business model innovation in general. Nonetheless, the canvas tools structure our understanding and help describe a business model by focusing on the relationships between the elements. This systems perspective (Bertalanffy, 1972) has proven useful in ensuing research including our own.

Design thinking. In essence, design thinking is a method used by designers to solve problems. To understand the concept of design thinking, we relate the works of Kimbell (2011) who sees three threads of research that can explain the various interpretations of design thinking. The first approach began in the 1960s by extending the works of Simon (1969) and it focuses on design thinking as a cognitive style. This approach to design thinking is based on research that sought to understand the process by which design, or better stated designers, solve problems. Kimbell sees many authors that built this view - Cross (1982), Schön (1983), Lawson (1997), Dorst (2006)- but she attributes the earliest discussion of the concept to Rowe's (1987) “Design thinking” where he explores the role of intuition in design and how the problem solving process itself influences the outcome.

Kimbell sees a second thread for design thinking within Buchanan's (1992) article on wicked problems. Buchanan points to the potential of design as a discipline by arguing that the design process can address complex (or wicked) problems that extend far beyond tangible products to greater orders of design. We will explore in greater detail the notion of orders of design later in this section. In Buchanan's view, design thinking represents a general theory of design and this design discipline has no subject matter of its own. Buchanan's approach to design thinking is less preoccupied with individual designers and their

process, but instead he works toward determining design's role in the world.

More than a decade later, a third thread for the design thinking emerged in the business journals oriented towards management practitioners. A design thinking movement was orchestrated for managers to solve their seemingly dialectical problems by using creativity and empathy for the customer (Brown, 2009). Marty Neumeier applies design thinking to problems a manager can not *manage* his way out of (2008). By rejecting a closed choice between two options, design thinking creates new solutions starting from consensual forms of reasoning. This was coined as *integrative thinking* (Martin, 2009). Creating a third way requires new approach that can combine the analytical approach taught by management schools and the situational understanding taught in social science schools (Collopy, 2004). We will return to the process of design thinking applied in a business context later in this chapter because it is the second part of the dual design process we propose.

Convergence of management and design

In the previous paragraphs we have pointed to many authors that bridge the gap between design and management. To further prove our point on the convergence of design and management research fields converging, we can point to the recent rise of multiple university programs uniting the two fields. To name a few examples: the New School of Parsons has a strategic design and management bachelor's degree, the Rothmans school of management has an MBA program in business design, the Aalto University school of art offers an international design business management masters degree and the Phd program at the Weatherhead school of management has a design and innovation track as well as a designing sustainable systems track. So we see that design and management are converging towards for

the better of business practices. Yet, they still have some contrasting aspects.

The main difference between management and design is that design purposely thrives on iteration loops to quickly evolve a project. Tom Kelly instilled the following ethos in the IDEO design consultancy: "*fail often to succeed sooner*"(Kelley and Littman, 2001, p.232). Johne (1996) writes about how managers seek to "*avoid mistakes with new products rather than using them as a means for exploiting market potentials*"(*p.177*). Beyond learning from failure, the design process supports and frames the different iteration efforts as a means towards success or satisfaction (Simon, 1987). This strongly relates to the d*esign thinking* movement as it is a creative process that seeks to influence the means by which managers devise strategy and manage change (Brown and Martin, 2015). Our point is that integrative thinking and design thinking is not exclusive to a designer. Just about any generative process leads to a form of synthesis. In management this phenomena can be linked to the learning organization (Senge, 1997). So, we conclude that within the convergence of design and management, there are some contradictory practices that make for some research threads to remain distinct.

For the first section of this chapter, we conclude on the contextual aspect of our conceptual framework. We argued how management and design fields are converging as they evolved from the manufacturing of product goods, to the provision of services and now to business models creating multiple forms of value. In figure 5, we plotted the course of management research to intersect with design research in creating a space for a potential 2nd generation of *organization design*. On one side, we believe that this convergence is at the root of the legitimacy for designers to use their creative know-how to address management issues. On the other side, researchers and managers are also advocating for designers to play a larger role in the strategic development of business organizations (Martin, 2009). Nonetheless, the

thought of designing a business model is rather novel to the profession of design. Now that we understand this context, we will explore these ideas by defining a design approach for organizations.

2.2 The means: a design approach

Defining a design has often been a difficult task because it is comprised of many intangible elements such as intuition, imagination and creativity (Hubka and Eder, 2012; Tovey, 1997). Moreover, the design activity is a difficult undertaking because it deals with more elusive elements such as ambiguity and uncertainty (Gaver et al., 2003; Norman, 2002b; Schrader et al., 1993). Although these human intangibles could be seen as barriers to scientific epistemologies, including heuristics enables design practice to confront and ultimately shape the reality of everyday life. So when speaking of design in research, it has been defined as a means to produce knowledge with the objective of moving towards preferred situations, in what has been called '*designerly ways of knowing*' by Cross (1981). Our design approach focuses on the practical aspect present this definition of design.

The Industrial Designers Society of America currently (IDSA) defines Industrial Design as: "*the professional service of creating and developing concepts and specifications that optimize the function, value and appearance of products and systems for the mutual benefit of both user and manufacturer.*" (IDSA, 2011) Beyond the confines of industrial design, the practice of design is expanded by an expertise on the creation of products, services, systems and experiences. To that list of deliverables, we have added the design of businesses (Brown, 2008). "*That designers work for or with organizations is a familiar concept. That design can have an impact upon organizations and that design thinking can shape organizational behavior in productive ways is less well established within the literature devoted to design and design practice*"(p. 1). We seek to study how organizations can be redesigned by strategic designers

and establish what could constitute their approach. Our interest lies in the creative aspect of business model innovation when an organization conceptualizes future business models to be more sustainable.

This research can be considered as example of the convergence of management and design because we take on a new role for a design researcher by applying a creative approach towards sustainable business models. Chesbrough (2010) sees business model innovation following a process similar to product innovation from idea to launch which is well known to designers. Others see business model innovation as a distinct transformation process described as moving through different phases of experimentation, acceleration, transition (Johnson, 2010). Within this management approach to business model transformation, we choose to focus the designer's role on the early experimentation phase. If we were to look at the scale of a business model transformation that can take years before becoming business as usual, we situate our research at the strategic level (Casadesus-Masanell and Ricart, 2010). This brings us to question, how can design take part in business model innovation? How can design generate the vision for a strategic transformation in organizations? For that we turn to foresight and advanced design.

Foresight and advanced design

Certain practices such as continuous improvement (Bessant and Caffyn, 1997), business plans (Mullins and Komisar, 2010) or even sustainability (Geels et al., 2008) emphasize the process towards improvement. We argue that there is too little thought put toward the destination when it comes to imagining a more sustainable future for organizations. By that we mean that organizations, especially small and medium businesses (SMEs), do not cultivate a competence in foresight to envision future products, services or business models (Branzei and Vertinsky, 2006; Major et al., 2001). Most organizations do not have the internal capacity or knowledge to partake in a foresight design effort like

some larger multinationals (Stonehouse and Pemberton, 2002). It simply is not part of their leader's agenda or innovation practices to generate a long term vision (Wang et al., 2007) nor to guide that vision towards being more sustainable (Will, 2008). Our goal is to lay the foundations for the emerging practice of consciously applying a design approach to the creation of business models for sustainability.

At some point in time, any organization, big or small, reaches a crossroad where strategic thinking points towards reinvention (Hart, 2005; White, 2013). There is a way to avoid ending up in a dilemma by planning and proactively orchestrating a transition (Christensen, 1997; Gilbert et al., 2012). For manufacturers, there is an imperative to always have new and improved products on the market. At an operational level, that implies managing an innovation process to filter ideas into desirable products (Cooper, 1988). Some of the techniques that innovative companies use are foresight exercises or advanced design concepts (Manzini and Jegou, 1998). A common example are concept cars that demonstrate coherent relationships between new design ideas, innovative technologies and potential markets segments.

Foresight and design share the objective of imagining the future. Foresight is "*a process of developing a range of views of possible ways in which the future could develop, and understanding these sufficiently well to be able to decide what decisions could be taken today to create the best possible tomorrow*" (Horton, 1999; p.5). Earlier, we have defined the design activity in its broadest sense as changing from current situations to preferred ones (Simon, 1969). Together, they can be employed for social or commercial purposes, preparing people and organizations for change. In a report by the international council of industrial design (ICSID, 2001), the authors claim that design can increase the impact of foresight. They argue that by adding design's capacity to visually expose concepts, foresight results in a

more compelling vision.

Vergragt and Brown (2007) express a vision as a “heuristic device to map a 'possibility space', [...] that can orient and structure actions and behaviours [...] and inspire societal actors to investigate and test alternatives from technology to behaviour to culture and institutions” (p.1109). They continue to discuss a vision as defining objectives both functional and non-functional (i.e. emotional). When researching the use of vision for radical innovation Lin and Luh (2009) cite the early research of Tepper (1996) who stated that vision “could help to allocate resources, to condense information, to jump across the boundaries of segmented scientific disciplines, and to assess technology and radical innovations”(p.191). Another reason to build a vision is that it supports organizational learning as is plays a role of a strong integrator (Bratianu et al., 2010). Futhermore, Lynna and Akgünb (2001) report that vision can be positively related to product success.

Gabrielli and Zoels demonstrate empirically how design research methods can strengthen foresight and innovation by enhancing scenarios with visual, spatial and experimental information (2003). In addition, the ICSID report states the benefits of foresight in design by contributing to develop thinking around environmental sustainability. Moreover, Bezold (2010) explains how foresight activities create a safe space for exploring challenging situations and he goes so far as to calling upon foresight scenarios to err on the side of boldness to get the most value out of them.

Similarly, Andriopoulos and Gotsi call upon foresight as a practice for “perpetual probing and learning in high-change environments” but they bear witness that research is scarce on the processes by which organizations practice foresight and mobilize its results (2006). This coincides with ICSID who conclude

their scoping report by acknowledging that there is further opportunity to make “explicit use of foresight research in design projects”.

Advanced design methods can be considered as form foresight design (Celi, 2014). Advanced design is “a *practice that imagines future perspectives by envisioning future products and processes. It mainly deals with extensive projects—extended in time, space, uncertainty, and complexity*” (Celaschi et al., 2011; p.6). Advanced design is widely used in industry to visualize possible future products and their scenarios of use. In other words, advanced design serves to bridge the gap between the field of research and its application in reality. Celaschi et al.(2011) write that in advanced design, the “*dichotomy of product and purpose is often resolved*”(p.9). This is done by projecting products concepts into a future scenario where an intent will be coherent. They cite examples of washing machines that use enzymes to clean or household appliances that recycle water. Nonetheless, concept cars are probably the most recognizable design outcome of advanced design by manufacturers. The authors do acknowledge that advanced design practice is moving its focus from physical functional products to more intangible dimensions of meaning and value. This expansion beyond materiality towards society and organizations is also extensively covered in a report on advanced design methods. Next, we continue to explore this theme from a design research perspective by outlining our own design approach.

So far we have based our research in light of the convergence of management theory and design theory. We had began by defining a design as a practice of improving towards preferred situations which can be applied to transform organizations. This transformation begins at a strategic level with an exploration phase of business model innovation (Johnson, 2010). We have situated how we plan to envision the transformation of an organization towards sustainability with two existing design practices: first foresight

delivers visions and second advanced design creates concepts and scenarios. We have seen that foresight and advanced design practices provide a general understanding of how design can be used towards organizational change. We now dive deeper. We posit three elemental parts that make up a design approach for our specific quest for sustainable business models. The answer to our research question "**What could constitute a design approach to envisioning sustainable business models?**" is rooted in the combination of the three following propositions. To describe each of the three propositions of a design approach we first grounding them in design research theory and then describe them more specifically with respect to our empirical research.

2.3 Theory supporting the elements of a design approach

The answer to what could constitute a design approach to sustainable business models begins with a conceptual framework. This conceptual framework emerges from searching for its individual elements. To do so, we instinctively turn to current practices in business model design centred around the use of the business model canvas tool. Then, when researching about design tools in the field of design methods, we found that the design process is also of great relevance in theory and in practice. We saw both tools and process as distinct elements of a design approach. Yet, tools and process remains an incomplete conceptual framework for a design approach because the end result is not taken into account. Moreover, we intend to design business models with the purpose of improving towards sustainability. Therefore, we needed to take into account the outcome of the design process. We found research that combine two elements either theoretically (Galbraith, 1995) or in practice (Poulikidou et al., 2014). In the field of strategic planning that unites these three elements of tools, process and outcomes (Chambers and Taylor, 1999).

To explain in detail why tools, process and outcomes are critical to designing sustainable business models, we first study their theoretical foundations individually and then second their specific application in the case of this research. In the discussion chapter, we will continue using this conceptual framework to report on our empirical use of these three elements individually, as well as collectively as a design approach.

2.3.1 Design Tools

The theoretical framework we propose for a design approach makes use of tools tailored for the goal of more sustainable business models. Our definition of tools in a design approach is any tangible manifestation or creation supporting a reflection upon the problem at hand. We can also refer to the use of traditional design tools such as sketches, mood boards and prototypes. Carroll (2006) studied three design tools that create a level playing field for designers and users to interact: scenario building, prototyping, and organizational representation. From his perspective of participatory design, these design tools have become a “lingua franca” to interact with users.

An early example of a design tool for management purposes comes from the works of Shostack (1977) who was the first to write about how to visually describe a service. She revealed that unsystematic design and control methods lie at the root of service failures. As a consequence, service development is usually characterized by trial and error rather than by a thoughtful use of tools like service blueprinting. Blueprinting tools can be used by designers, business managers, and software engineers during service development. They represent a potential process, and then work as a guide for managers who operate the service on a day-to-day basis. Designers use blueprinting tools to ensure that the service is centred on the customer's experience. All tangible activities and hidden processes defined in the blueprint are

thought out in terms of user experience.

Today, we see great value in structured tools such as Pigneur and Osterwalder's business model canvas (2010). A canvas is an interesting case of a hybrid between a generative tool for designer and an analytical tool for management.

2.3.2 Design Process

Second, we posit that a design approach implies a process. To refer back to the original definition of design by Simon, this design process should foster the intention of 'changing from existing situations to preferred ones'. As we have seen in the convergence of management and design, the design process is a field rich with many different interpretation of the design process (Cross et al., 1981; Jones, 1969; Quarante, 1984). In the end, three dimensions are present in all interpretations: analysis, synthesis, and realization. The notion of divergence and convergence was also present in all interpretations. For a better understanding of the design process we refer to later works by Jones (1992), when he states that the design process is not a systematic step-by-step sequence of pre-determined activities. In contrast, creativity works best when moving forwards building on learning and knowledge generated. Designers, with their global point of view, are called on to create new concepts and new situations that do not necessarily fit any existing problem spaces. Therefore the designer needs to find the right pieces before beginning to solve the puzzle. Creativity works best when progressing in multiple back and forth motions between the problem and solutions spaces (Jones, 1969).

One of the means by which the design process generates preferred states arises from what Schön's (1983) has called “refl*ective practic*e”. As the design project moves forward, new information is

discovered on the nature of the work performed in the current and previous stages. Schön recognizes this "*talk-back*" from the design activity as an indicator of a good design process: "*In a good process of design, this conversation with the situation is reflective. In answer to the situation's back-talk, the designer reflects-in-action on the construction of the problem, the strategies of action, or the model of the phenomena, which have been implicit in his moves."*(p.73).

Any design process must permit multiple kinds of logical, ethical or creative thoughts to coexist within the iterative progress of the project (Findeli, 2001). The design process is described by Findeli (2001) as an ongoing loop linking thinking and acting as well as inspiration and expiration. For our research, we underline that any design method must permit multiple kinds of thought. For Findeli and Bousbaci (2005), design methods move at different levels of philosophical thinking from aesthetics to logics and now ethical, and yet they coexist within the notion of the design project.

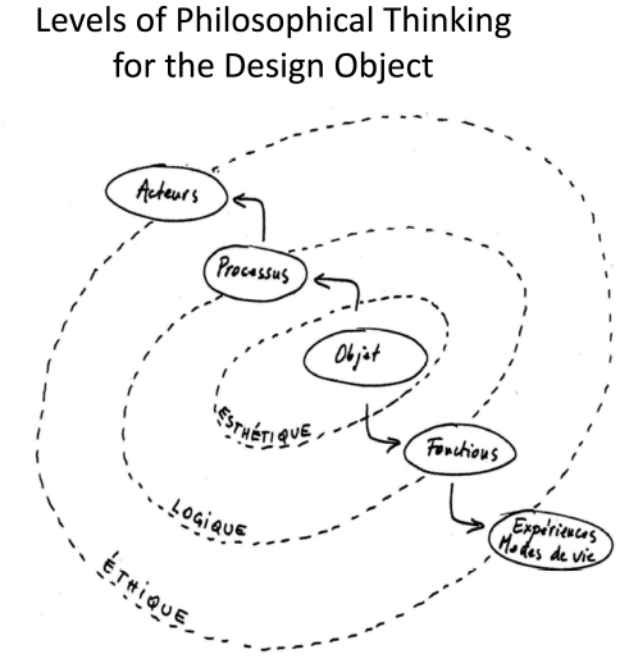

Figure 6. Design methods move at different levels of philosophical thinking from aesthetics to logics and now ethical, and yet they

coexist within the notion of the design project. Reproduced from Findeli and Bousbaci (2005)

We propose that a third characteristic of a design approach concern the consequences following the use of tools within an iterative process.

2.3.3 Design outcomes

There has been much research about how sustainability can be measured as an outcome (Bond et al., 2010; Porter, 2008; Pullman et al., 2009). Stemming from marketing research, a practice named "Outcome-driven innovation" focused on the results clients wanted (Ulwick, 2005). However, design outcomes are less common in research and in practice. The term design outcomes was defined by Kruger and Cross (2006) as the "*qualitative aspects of the resulting design concepts produced by the designers*" (p.529). Their research suggests that the difference between a design process and its outcomes is the consequence of the application of strategic knowledge. In other words, different design processes lead to different outcomes. Design outcomes integrate a vision of the future while at the same time enabling future iterations. Design outcomes, such as concept sketches (see figure 17 and figure 18 for examples), embody knowledge and can even be used to track the progress of ideas (Rodgers et al., 2000). This means that a design outcome is characterized by its capacity to be improved upon in multiple generations of previous outcomes.

The artifacts that are ideas, sketches, prototypes, blueprints, field tests, and business model concepts can all be interpreted as design outcomes because they all can be improved upon. Some outcomes are more tangible than others. Some are more relevant to the design activity than others. No matter the form, we argue for design outcomes to be considered as an element of a design approach because they

are the stepping stones towards progress and preferred states.

We also need distinguish a design outcome from a design output, where a design output is simply the tangible result of a design activity. For example the lines that make up a sketch is an output. The idea that those lines can create a more dynamic appearance is an outcome because it emerges as a qualitative interpretation of the output. This qualitative nature of outcomes means that they can arise at every step of the way in the progress of a project. Moreover, design outcomes are not necessarily a final artifact, result or output. Design outcomes do not need to be a product for sale in retail or an implemented business model.

To understand the benefits of taking into accounts outcomes in a design approach, we draw a parallel to the benefits of a systems approach as was proposed by Hawken et al. (1999) in their seminal book Natural Capitalism. They argue: "*Designing a window without the building, a light without the room, or a motor without the machine it drives works as badly as designing a pelican without the fish. Optimizing components in isolation tends to pessimize the whole system—and hence the bottom line*" (p.117). The outcome thus builds on the tangible result to generate an understanding of the consequences of that result within the greater perspective of the project.

A design approach that follows a process and makes use of tools but does not consider its outcomes would be like a trip and a map without a sense of destination. Outcomes are also an indication of a good process as argued by Sodek and Jain (2004). They suggest that "*the goodness of a design process should be measured by the quality of its outcomes*"(p.1). Simply put a design outcome is the qualitative understanding of the outputs of a design activity.

When describing the design process we exposed the importance of iteration and learning from failures. The same philosophy can be applied to our third proposition of design outcomes. The point of a design outcome is first to take into account the result of an iteration, to then build upon successive iterations. This progress is what allows to move up in scale, or deeper in understanding. An outcome leads to more outcomes. For example, an idea grows to a concept, then a project, a product or service and then a successful business model. We need to stress that design outcomes are not necessarily a final result such as a functional product, an efficient service or a competitive business model. Yet ultimately, an outcome can become a solution.

To demonstrate the use of the design outcomes we turn to the deep field of research that focuses on sketches. We seek to underline this idea of using outcomes within a design approach. We build an analogy and follow inductive reasoning to argue that sketches demonstrate three characteristics which can be generalized and expected from design outcomes. In this instance, we seek to emphasize the capacity to generate qualitative intangibles and feed iterative loops of the design process. In summary, we wonder what can outcomes accomplish in a design approach. To answer that we infer a response with the particular case of the characteristics of sketches.

Goel (1995) clearly demonstrates how sketches, by virtue of being ambiguous, vague and imprecise, play a pivotal role in creative problem solving. He distinguishes two types of transformation that arise from drawing sketches. Vertical transformation happens when one idea is refined and further detailed. Lateral transformation happens when one idea leads to another at the same level. In architectural design (Do et al., 2000), sketching can serve 6 functions: “generating concepts, externalizing and visualizing problems,

facilitating problem solving and creative effort, facilitating perception and translation of ideas, representing real world artifacts that can be manipulated and reasoned with, and revising and refining ideas". From some of these functions on the list, we see that this research focuses on the activity of sketching which would relate, in our analogy, to the design process. We use this as a counter-example to show that we are not interested in the characteristics that speak to the activity of sketching. In contrast, we are attuned to the characteristics of sketches that portray the influence of the sketch as an outcome.

When studied in the field of cognitive psychology, design sketches enable a) working memory b) imagery reinterpretation and c) mental synthesis (Purcell and Gero, 1998). We build our understanding of a design outcome in line with these three characteristics from sketches. Serving as a working memory of successive states, the design outcomes can demonstrate a learning curve and growth. This means an outcome can be seen as something that can "be manipulated and reasoned with". The second characteristic of imagery interpretation testifies to the capacity of sketches to serve as a communication medium both for the designer himself (Schön, 1983) and when exchanging with others. This allows for the convergence of thought from a tangible representation that can be abstractly reinterpreted over and over again. Therefore we expect design outcomes not to be static but to contain within themselves a potential for an ongoing transformation. Design outcomes are these reinterpretations that allow for multiple futures. Lastly, design outcomes can substantiate the integration of multiple ideas in a form of mental synthesis. Like sketches, design outcomes embody the qualitative interpretations that can spark further understanding. We will revisit these three characteristics empirically in our discussion chapter as we further expose the role that design outcomes can play in a design approach.

2.3.4 Summary of the three propositions for a design approach to more sustainable business models

Proposition 1:

A design approach makes use of **tools** to envision business models for sustainability.

Organizations should make use of tools created to design sustainability into a business model. We propose an adaptations of Pigneur and Osterwalder's (2010) business model canvas but other tools have begun to emerge such as Upward's canvas (2013). Other types of design tools can further illustrate the sustainability aspects of a business model, such as scenarios (Morelli, 2003) or blueprints (Shostack, 1982).

Proposition 2:

A design approach enables an intentional **process** towards business models for sustainability.

Organizations that adopt a design approach to more sustainable business models should follow a design process that allows for creative exploration. One that builds on iteration, learning and progress (Jones, 1992). This process should be both divergent and convergent, enabling phases of discovery and development. Lastly, this design process should enable stakeholders to participate as they provide knowledge and boundaries for greater relevancy.

Proposition 3:

A design approach builds upon multiple **outcomes** towards a business model for sustainability.

Organizations should first perceive their existing business model as an initial design outcome upon which they can conceptualize an even more sustainable outcome. By emulating different business model patterns, organizations can learn from their business model concepts in successive steps towards sustainability. Outcomes also allow to envision different futures and generate a common understanding of the direction the organization should progress towards.

2.4 Our design approach

We conclude this conceptual framework chapter by going into the specifics of how we used each of the three design elements - tools, process and outcomes, in the case of this research on sustainable business models.

2.4.1 Our design tools

We now dive deeper into the design tool that we created for the purpose of imagining new business models to be more sustainable. To do so we worked on creating a canvas tool for the specific case of sustainable business models by adding to an existing business model design structure.

When looking to innovate on an organization's business model, tools such as a business model canvas can be used to answer multiple tasks. Osterwalder and Pigneur's (2010) business model canvas is a popular and widely used tool for framing an organization's business model. Such a canvas provides a structured visual framework which synthesizes key organizational components and interconnections. Additionally, as an explicit visual representation of the business model, a canvas can facilitate discussion, debate, and exploration of potential innovation of the underlying business model. Moreover, by visualizing a business model in a structured framework, users can get a more holistic perspective of an organization's impacts as well as highlight where an organization may have the greatest value creating impact (Wallin et al., 2013; Bocken et al., 2013). For all these reasons, a canvas can support the creative design process of prototyping, feedback, and iteration which can support successful business model innovation.

Osterwalder & Pigneur's (2010) business model canvas distills an organization's business model into nine components - customer value proposition, segments, customer relationships, channels, key resources, key activities, partners, costs and revenues (cf., Osterwalder & Pigneur, 2010 for more on each component). Their business model canvas has been downloaded over three millions times since its publication online; and has been widely adopted as a tool for concisely presenting an organization's business model by both practitioners (Nordic Innovation, 2012; OECD et al., 2012; Kaplan, 2012) and researchers (Wallin et al., 2013; Bocken et al., 2013). Shown in figure 7 is the original business model canvas structure which has been adopted, without modification, as the economic layer of the Triple Layered Business model canvas. This canvas exposes the nine components with the example of the Nespresso business model content which will also be used later in the artifacts description chapter.

Economic business model canvas

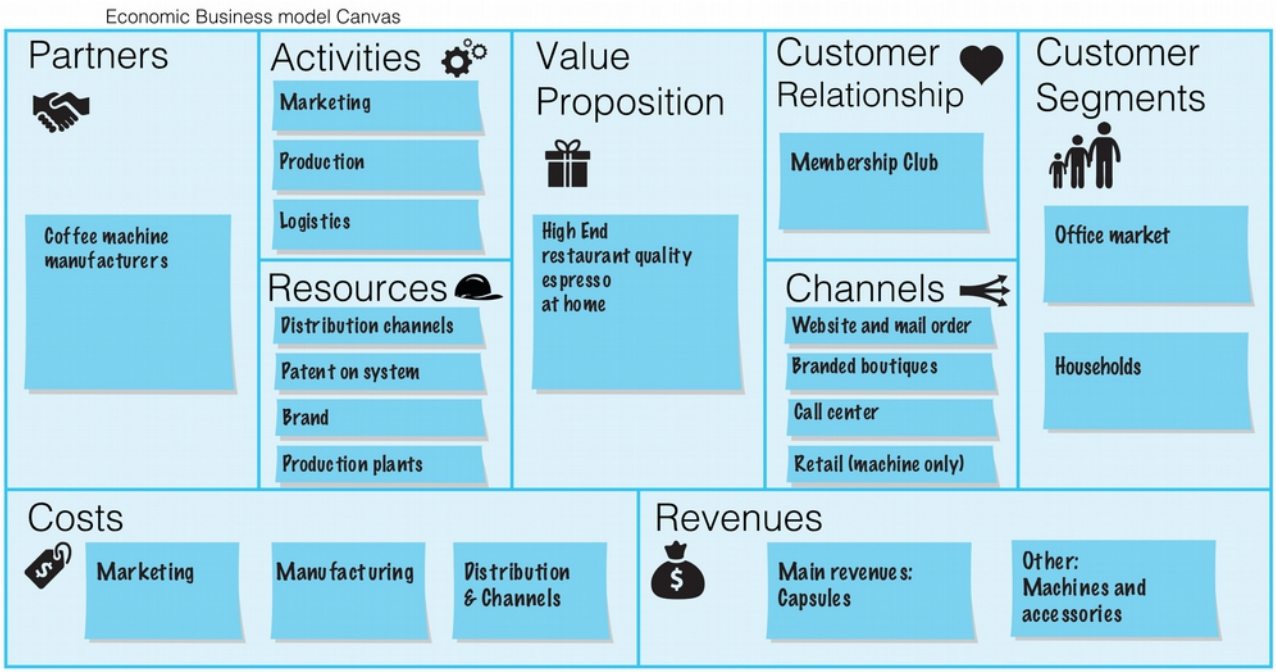

Figure 7. The Economic layer of the Triple Layered Business Model Canvas with the Nespresso example as content.

While Osterwalder and Pigneur (2011) do demonstrate how some businesses can align profit and purpose to support more sustainability-oriented value creation, there has been some critique of their canvas as having a 'profit first' philosophy (Upward, 2013). The original canvas provides a means for assessing that revenues are greater than costs and does not specifically tend to environmental or social benefits. We concur with this critique and for the need to develop a business model canvas which explicitly integrates multiple types of value creation. In developing the triple layered business model canvas, we endeavoured for different types of value to be explicitly addressed in this design tool.

In seeking how to integrate multiple types of value and how to make sustainability a competitive advantage (Willard, 2012), we choose to include the idea of the triple bottom line at the business model level. This triple bottom line approach advocates that organizations should consider the combined economic, environmental, and social impacts of their actions when making decisions, rather than focusing primarily on economic impacts (Savitz, 2012). Although, we do reiterate as in our introduction that the triple bottom line approach has been criticized for simplifying sustainability's complexity (Norman and MacDonald, 2004; Vanclay, 2004; Mitchell, 2007), we must acknowledge that is has also been adopted by many organizations when considering their action and become a core aspect of sustainability thinking through the Global Report initiative (GRI). It does provide a useful perspective when it comes to documenting organizational actions and impacts. In the artifacts description chapter, we present how this triple bottom line thinking influenced the structure of the canvas tool we elaborated. The following section will present the foundation of a secondary tool, business model patterns, for it facilitates the use of the canvas.

As we began developing the canvas tool, we quickly realized that participants were unaware of the variety of existing business models. Inspired by the work of Bocken et al. (2013b) on business model archetypes, we saw an opportunity to educate our participants with some examples of easily recognizable patterns. Take for example the razors and blades pattern which was applied in the personal printer industry where manufacturers generate more revenues from reoccurring sales of the consumable that is the ink.

Coming from the architecture design field, Alexander (1977) states that a pattern “describes a problem which occurs over and over again in our environment, and then describes the core of the solution to that problem, in such a way that you can use this solution a million times over, without ever doing it the same way twice.” A business model pattern follows Alexander's logic by addressing the means by which a business creates value for this client. Therefore when combining the notion of a pattern and a business model we focus on the capacity to create value. The means, the mechanism, the “how” or the rationale of a business model generates a pattern. That business model pattern can be considered as a solution, but because each business context is different, each application of the business model pattern will not ever lead to the same organization.

To begin fashioning a tool that uses existing business model patterns, we listed of about 60 patterns amongst the research and practitioner papers in table 3. One of the most prominent and comprehensive research efforts on business model patterns was done by researchers at the

University of St. Gallen (Gassmann et al., 2014). They established 55 business model patterns from studying over 250 business models. Some of these patterns solely represent a revenue model such as auctions or leasing, others influence the entire business approach such as “razor and blade” or “hidden revenue”. Even though this set of 55 patterns is extensive, it focuses on traditional economic aspects of a business model only. The nordic innovation report (Bisgaard, T.; Henriksen, K. & Bjerre, M. 2012) seeks to influence the adoption of 8 different “green” business models by demonstrating the environmental benefits of such a transformation. The Uk consulting firm SustainAbility described 20 business models from empirical examples of firms having undertaken a transformation (Clinton, L. & Whisnant, R. 2014). A range of archetypes for business models for sustainability was introduced (Bocken et al., 2014).

References for our business model patterns

Researchers	**Amount identified**	**Pattern type**	**Affiliation**
(Gassmann et al., 2014)	55	Economic business models	St-Gallen
(Bisgaard, T.; Henriksen, K. & Bjerre, M. 2012)	8	green business models	Nordic innovation
(Bocken et al., 2014)	8 54	Sustainability archetypes Examples	TUDelft
(Clinton, L. & Whisnant, R. 2014)	20	Sustainable business model behaviours	SustainAbility UK

Table 3. List of references identifying various business models that we used to create our business model pattern tool.

From this list of about 100 business models patterns, we classified them in terms of economic, environmental and social dimensions. To avoid overwhelming workshop participants with too

many patterns, we reduced the overall number of patterns. We combined similar concepts and excluded some less salient patterns. In the artifacts section, we will expose the set of 24 business model patterns cards we chose and used in our workshops.

2.4.2 Our Design Process

For this research on sustainable business models, we chose to combine two types of design processes, co-design and design thinking. The main reason we need two processes is to answer the weaknesses of one with the strengths of the other. This combination of processes leads to more creative and more pertinent outcomes. We now dive deeper into each process to understand why we need both of them together.

Co-creation process. The roots of co-creation begin in the 1970's with participatory design approaches. Theses approaches comprised of tools and cooperative techniques used in activities such as workshops, prototyping, and planning. Participatory design practices such as co-creation were developed to provide users the means to take an active part in the design process. (Bødker, 2003). As an expert within the participatory field, Carroll (2006) defines participatory design as "*the direct inclusion of users within a development team, such that they actively help in setting design goals and planning prototypes*". The difference between participatory design and co-creation lies in that co-creation does not assume that any stakeholder has a more important role to play in the participatory design process. Co-creation as a design process was defined Sanders and Stappers (2008) as "*any act of collective creativity, i.e., creativity that is shared by two or more people*". By defining co-creation in a broad meaning, the authors point to a collective creativity that can be applied in a design process with applications ranging from the physical to the metaphysical.

The diversity of all participatory practices has not led to a single theory, paradigm of study nor common approach to practice (Slater, 1998). Rather, different perspectives focus on certain aspects of user involvement and most of participatory design theories and practices require simply the combination of multiple perspectives (Muller, 2003). We argue that this need for multiple perspectives should also enable multiple design processes. This explains why we choose to enhance a co-creation process with a design thinking process.

Vicente (1999) brings to the table some limitations to participatory design: leaving possibilities of new technologies unexplored, the use of incomplete design methods such as scenarios or prototyping, and the lack of purpose when analyzing the design's progression. To palliate to these deficiencies, Bødker and Iversen (2002) offer a frame set to facilitate the development of the project. They prone an interesting hybrid approach where the designer facilitates the process. They propose that the designer must envision a strategy for the entire process. This strategy should evolve and develop itself depending on the users, the situation and the progress of the design activity.

Bødker and Iversen state that users need to be implicated in the design process, but they proposed that the participative process requires the planning and intervention of the designer to insure its success. They call this professional participative design (proPD). In developing proPD, the authors respond to the limitations foreseen by Vicente. They propose using scenarios and prototyping and reflecting on the initial problem to have a sense of perspective upon the process. The authors state that the advantage of a professional participative design process is that it remains always in context because the designers implicate problem owners directly in the solution process. Yet, the problem owners might not have the

capacity, experience or time to envision future solutions to complex problems such as business model sustainability. In this research, we hypothesize that some short-comings of a co-creation process in creating more sustainable business models can be levelled out if the designer can also play the role of an external consultant specialized in design thinking.

Design thinking process. Earlier in this section we described three threads of design thinking as seen by Kimbell (1991). We now focus on the process aspect of design thinking as we will integrate it in our workshops. We plan to use a design thinking process to open the way for a deeper understanding of problems by conducting empirical research situated in the context of real life situations. This will require for the design thinker to simultaneously evolve his understanding of the situation and his approach to improving it as suggested by Brown and Martin (2015).

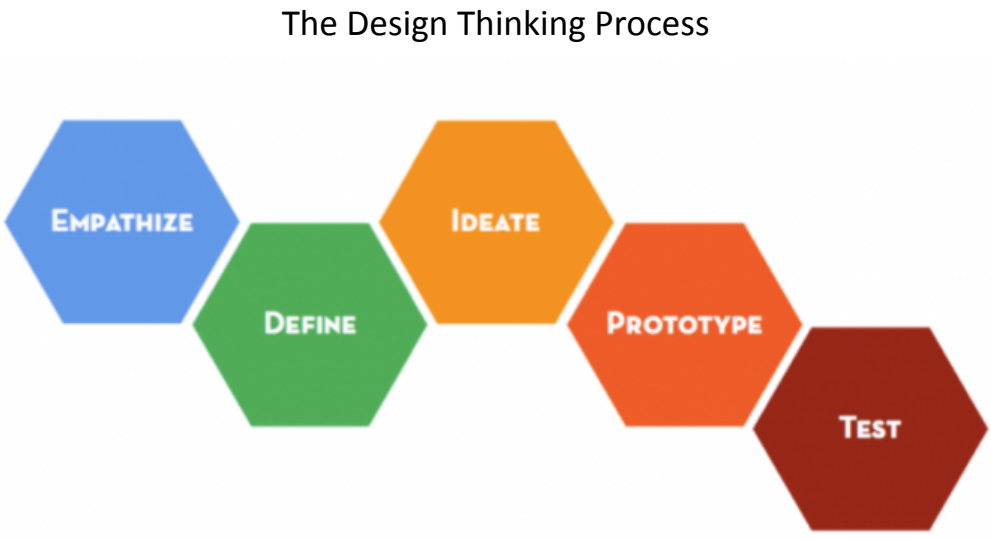

Figure 8. This image of the design thinking process was reproduced from the Stanford D. School where they teach design skills and methods to management professionals.

Design thinking remains an intuitive approach taught in industrial design schools. Like a reflex or a part of their DNA, designers use these methods tacitly. Moving from analysis to synthesis in successive iterations, the design practitioner evolves his understanding of the situation (Cross, 2001). A design thinker can critique his own practice and adjust it in reaction to the dynamics of the context (Schön 1983). Complex problems require designers to create ways into them by conducting empirical experiences situated in the context of real life conditions. This approach is the essence of design thinking.

2.4.3 Our Design outcomes

The specific case of **design outcomes of advanced design and design foresight** is what we are most interested in for this research on sustainable business models. They work at influencing mindsets as well as pointing towards technical potential (Vecchiato and Roveda, 2010; Vergragt and Brown, 2007). Moreover, we argue that design outcomes remain within the order of scale of the effort put into it. The efforts that go into a full week of exploration workshops with external facilitators should balance out with outcomes such as transformative ideas and group consensus on new directions for the organization.

For this particular research on sustainable business models, we seek to study how multiple types of outcomes can be used together to create a more vivid understanding of a future business model to be more sustainable. We see three levels of outcomes that can be embedded one in the another: products, services and business models. We explore those levels of design outcomes in the following section.

By expanding on the different actions of design as well as on the different outcomes, Buchanan (1998)

demonstrated how design has evolved reaching out to other fields such as management. He describes the matrix, in the following figure, as an interpretative lens for investigating the "*shifting debate about design in the contemporary world*". He creates four levels called "*orders of design*". First is *communication* which creates signs and words, second *construction* which creates things or products, third *strategic planning* which creates interaction such as services and fourth *systemic integration* which creates thoughts such as systems like business models. Buchanan then intersects these orders with design abilities, which are *inventing*, *judging*, *deciding* and *evaluating*. Therefore with this contemporary understanding of potential outcomes of design, organizations can move past the tangible outcomes of a construction nature from product design to understand broader outcomes in terms of systems from business models and organizations themselves.

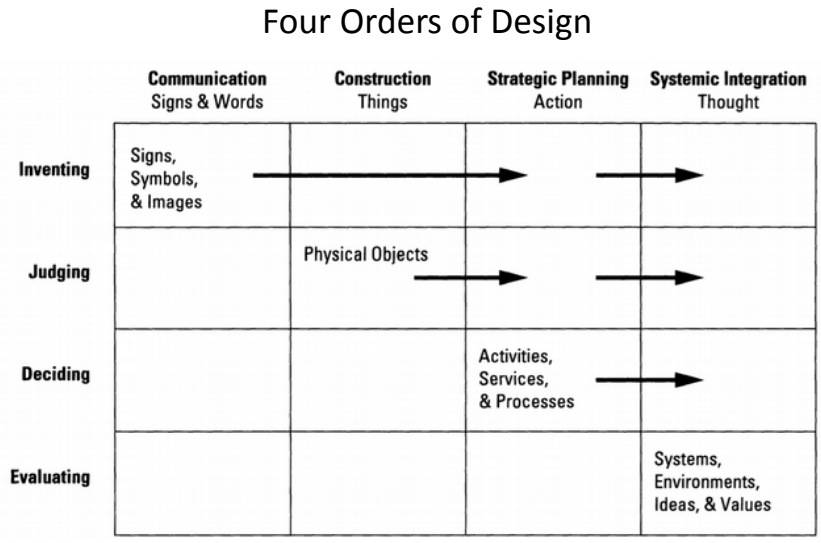

Figure 9. Design has evolved reaching out to broader fields of intervention. Reproduced from Buchanan (1998)

For the purposes of defining our outcomes in this research we dive deeper into the latter three levels of Buchanan's matrix: products (things), services (actions) and business models (thoughts). Our contention is that to arrive at more sustainable business models, we seek a coherence between a) product functions, b) service interactions and c) business models concepts. These three design outcomes build on Buchanan's orders of design and they also follow the progression we exposed earlier in the convergence of the management and design research fields.

Business model concepts. Business models have be defined as "*articulating the logic, data and other evidence that support the value proposition for the customer, and the viable structure revenues and costs for the enterprise delivering that value*" (Teece, 2010;p.178). Similarly, Osterwalder and Pigneur (2010) describes how a business model is a way to create, deliver and capture value. We introduced earlier their structured nine box canvas has widely spread as means to communicate business model concepts. Again, it is composed of customer value proposition, segments, customer relationships, channels, key resources, key activities, partners, costs and revenues. In the results chapter of this research, we will expose how we built upon the original business model canvas that measured only economic performance by adding an environmental and a social layers and thus ended up crafting a triple layered business model canvas. By using this tool in our fieldwork, we will arrive at more sustainable business model concepts that create, deliver and capture a triple top line approach to value (McDonough and Braungart, 2002).

Services scenarios. According to Hill (1977) a service is "*a change in the condition of a person, or a good belonging to some economic entity, brought about as the result of the activity of some other economic entity, with the approval of the first person or economic entity*." Near the end of the 80s, the distinction

between products and services was made clear with four distinctions: intangibility, perishability, simultaneity and heterogeneity (Parasuraman, Berry & Zeithaml 1988). In their book "Service Design Thinking", Stickdorn and Schneider (2012) describe a service as composed of five elements: actors, touchpoints, offer, needs and experiences. Described in greater detail by Polaine et al. (2013) an actor is anyone who takes part of the service relationship such as the customer, the paying client, the end-user, the provider, the salesperson and so on. A touchpoint is the moment in time and space when a client interacts with a service. They illustrate 7 common touchpoints: people, mobile, web, print, marketing, products and other services (p.23). For experiences, the authors detail four types that can be designed in a service offering. First is a user experience that applies to interactions with any type of technology or interface. Second is a customer experience that takes place when interacting with brands most often in a retail context. Third is a service provider experience is similar to a business to business context where the actor is in a chain of relationships sometimes facing an external client or even an internal client. Fourth, the human experience is based on an emotional and personal connexion. These five elements will be present in all our service scenarios.

Products designs. A product is defined as anything that can be offered to an individual, a group of people or an organization for use, attention, acquisition or consumption to satisfy a need or a want (Kotler and Armstrong 2010). There are many means of evaluating a product. For example Kruger and Cross (2006) reduce the variables to creativity, aesthetics, technical aspects, ergonomics and business aspects. For this research we devise outcomes from advanced product functions. Because our emphasis is first on business models, we will develop product designs as a potential value proposition. For example, we will not focus on designing a new bath tub, but in reinterpreting the hygiene function of the

bath space. So, our product concepts will go beyond a current product approach (often based on features) towards a new product vision (based on value). We will provide an intent to create a new form of value both for the user and the organization.

2.5 Conclusion of the conceptual framework

Our theoretical framework revisits past and present research literature to reveal what is a design approach to sustainable business models. We started by framing the context of this approach within the evolution of the fields of management research and design research. We illustrated how they have been converging with the movement for design thinking and business model innovation. Second, we defined how design can play a role as an approach to address organizational issues by targeting our intervention at the strategic level of business models for sustainability with foresight and advanced design. We then proposed three elements that constitute a design approach: the use of tools, an intentional process and building upon multiple outcomes. It is our contention that these three elements should be applied in the early exploratory phase when transforming a business models for sustainability. Next, we share our methods to arrive at demonstrating the relevancy of the three elements we propose for a design approach to more sustainable business models.

Chapter 3. Methods

It is difficult to study a posteriori the influence of a design approach during business model innovation for it can take decades to go from exploration, to acceleration to implementation. Add to that the factor of sustainable business models and the potential sample size for research is drastically reduced. What is more, we have raised earlier how sustainability is not taking root in organizations at the height of our society's challenges. These are all reasons why we turn to action research as a promising method for further validating our three propositions. Alternatives such as quantitative or qualitative research either do not *fit* the problem or can not recreate this specific practice of designing sustainable business models.

Swann (2002) discussed the similarities in an action research method and a design methods in that they both generate knowledge from practice and iteration. Both are mutually reinforcing as in the case of action research the end goal is of a scientific abstraction where as the design approach leads to a practical synthesis. However, design research differs from classical scientific research according to Simon (1969). Design research is partly interested in questioning present states (what is?) but more so as means to question future states (what ought to be?). This is the core of design research that can be found in this research as we question what ought to be a design approach towards more sustainable business models?

Action research is participatory by nature which makes it suitable for exploring “latent dynamics” in organizations (Argyris, 1993). Again, the very notion of a business model is often still tacit in most organizations (Teece, 2010). It makes it even harder to study the design of something that is not explicit

for participants. Our action research method creates a protocol to study how we attempt to inspire organizations forwards by designing more sustainable business models concepts.

Within this section of the dissertation, we present the methods that guided our field as we gathered evidence to defend our three elements of a design approach. The goal of this methods chapter is to take a broader look at why and how we orchestrated our action research field studies. To do so, we structure the parts of our method following Stringer's approach to action research (2013) and adding some of Patton's elements to qualitative research (2005). The 8 parts we choose to present our method are: Epistemology, purpose, protocol, unit of measure, data sources, data analysis, limits and ethics.

3.1 Epistemological approach

Action research finds its roots in Dewey's approach of *"learning by doing" (1909)*. It is Lewin (1946) that first used the term "action research" to describe his research on social action by influencing the conditions and effects that lead to further social action. The most famous appeal for action research is embedded in this now famous quote: "There is nothing so practical as a good theory" (Lewin, 1951, p. 169). Theory informs practice, practice refines theory, in a continuous evolution. MacIsaac (1995) illustrates this process with spiral steps, each composed of planning, action and fact-finding about the result of the action. In other words, an action research method matures the proposed protocol in light of the context of application.

Simply put, a group of people identify a problem, act upon the situation, validate their efforts, and if not solved, they attempt to resolve the problem again while taking into account the lessons learned in the first iteration. This approach is also used to research professional practices by investigating successive

cycles of action (Winter and Zuber-Skerritt, 1996). The distinction with practical knowledge for professional improvement comes with the rigour of scientific research and its endeavour to generate new theoretical knowledge. In other words, a pragmatist context links theory and praxis towards solving a real world problem. The following process diagram represents the cyclical nature of action research:

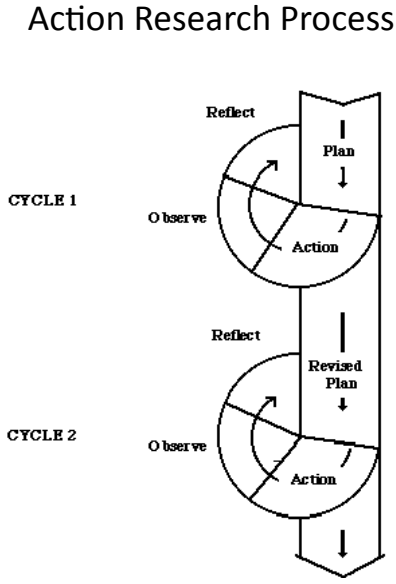

Figure 10. The action research process cycles illustrated with spiral steps. Reproduced from MacIsaac 1995.

In similar fashion to the context and problem we exposed in the previous literature research, action research aims to contribute both to further the goals of social science while simultaneously to answer the practical concerns of participants in an immediate problematic situation (Stringer, 2013). There are two simultaneous objectives to action research. The first is to try to solve the problem at hand by producing "*practical knowledge that is useful to people in the everyday conduct of their lives*" (Reason and Bradbury, 2001, p. 2). The second is to provide the field of research with new knowledge that addresses gaps within the field of research. O'Brien (1998) speaks of this dual commitment in action research to study a system and concurrently to collaborate with members of the system towards a

desirable direction. So to accomplish this twin goal requires the active collaboration of researcher and participant, and thus it stresses the importance of co-learning as a primary aspect of the research process (Gilmore et al., 1986).

By working on the development of an epistemology for a design Phd, the team of Pedgley and Wormald (2007) propose three approaches to generate knowledge when researching through design:

-Finding out about current design practices

(e.g., pursuing a design project to help uncover decision-making processes)

-Devising improvements in design methods

(e.g., pursuing a design project to help conceive and develop new design procedures, information and tools)

-Making improvements to designed artifacts

(e.g., pursuing a design project to help contribute to what is known about how a type of product can or ought to be designed, how it can be improved, and to demonstrate the benefits to be gained).

In our action based research, we touch all three approaches proposed by Pedgley and Wormald. First, we find out about current design practices, and in this case a lack there of. Second, we devise improvements to design methods by conceiving new tools. Third, we made improvements to designed artifacts in the form of more sustainable business model concepts. In sum, our research activities will generate knowledge through the cycles of creation, evaluation and synthesis applied to our design approach to sustainable business models. Knowledge was created while developing the project (Winter and Burroughs, 1989). Action research involved a reflective practitioner (Schön, 1983) who learned by doing, improved his methods along the way and now reports upon the findings and insights.

3.2 Research purpose

Action research entails an intervention to generate the occurrence of a practical action. Consequently, the researcher plays a role in the production and collection of data because designing sustainable business models is an emerging practice that does not yet exist. Action research is best suited for our research goals because without the initiative of the researcher there would be no data to collect and analyze.

Our main purpose is to inspire organizations towards designing sustainable business models. We hope to guide them by exposing the elements of a design approach while demonstrating the benefits and potential sustainable business models concepts that arise from a design approach. Our research protocol has for objective to validate our proposition of what constitutes a design approach by studying our own journey and the resulting data we have created by following our protocol. By focusing on what constitutes the means we seek to influence organizations in undertaking the design of more sustainable business models.

Within action research methods, specific approaches can vary widely depending on the purpose. Nonetheless, the criteria of relevance and rigour remain to be upheld (Melrose, 2001). Three types of action research have been distinguished by Chisholm and Elden (1993) : instrumental, theoretical and emancipatory. We consider our approach to be instrumental action research on the grounds that our goal is to outline a practice for designing sustainable business models.

3.3 Research protocol and unit of analysis

It is difficult to discuss our research protocol in general because it was composed for three distinct units of analysis; we will summarize each research protocol individually.

For the first element of our design approach, the unit of analysis under study was our sustainable business model design tool. Over the course of two years, we carefully crafted a tool to guide organizations in thinking about their business model more sustainably. We met individually with 7 experts from both research and consulting such as Yves Pigneur who was at the origin of the business model canvas. We gathered their feedback to improve the structure and the theory behind the tools we were developing. We tested and learned from each iteration as we conducted 18 workshops with over 400 participants ranging from 250+ undergraduate and graduate students, 90+ entrepreneurs, 50+ business professionals, and 20+ research scholars. (See Table 4 for the complete list of workshops). In the subsequent chapter, we discuss at length the theoretical foundation, the structure and the uses for our sustainable business model design tool. Once mature, we ended up calling the tool the Triple Layered Business Model Canvas (TLBMC) and made it available under the creative commons license.

The second element of our design approach we studied, as a unit of analysis, was the design process. As revealed earlier, a design process is creative, iterative and generates learning. So we devised foresight workshops to compare and contrast two complementary design processes. The first was co-creation and the second was design thinking. We orchestrated full day co-creation workshops which put our tool to use with 19 professional innovators working for 13 manufacturing companies. During the first half of the workshop, the participants were introduced to the tool and they focused on understanding and illustrating the current business model of their respective organizations. This provided a baseline of how

their current business model generates economic, social and environmental value in terms of positive benefits and negative impacts. In the second half, we entered a creative phase where in teams of three or four, each group took turns finding opportunities and proposing ideas to imagine how the business model could be even more sustainable. The workshops concluded with the participants each presenting their sustainable business model concepts. For the second process, the researcher chose to redesign starting from the current business model for 5 cases among the 13 participating manufacturing companies. These 5 organizations were chosen because they showed most interest in business model innovation and thus could provide feedback upon demand. By taking on the role of an external designer and following a design thinking process, the researcher conceptualized more sustainable business models 10-30 years into the future. This design thinking process was filled with creativity and iteration as ideas for one outcome influenced the others. In the results chapter, we explore the strengths of each process and how the design thinking process built upon the co-creation process to arrive at further reaching business models for sustainability.

Because it is difficult to study a posteriori the influence of a design approach on the transformation of a business model for sustainability, we devised a protocol to actively participate in successive workshops. Thus, our action research is composed of planning, interaction, creation and analysis of the results as proposed by O'Brien (1998). We mentioned earlier how we acknowledged a problem in that small and medium enterprises, and many larger corporations for that matter, do not partake in foresight design to elaborate a vision of a sustainable future. We attempted to resolve this problem by developing a design approach. Our research protocol instructed the preparation and facilitation of multiple workshops with a consistent design approach.

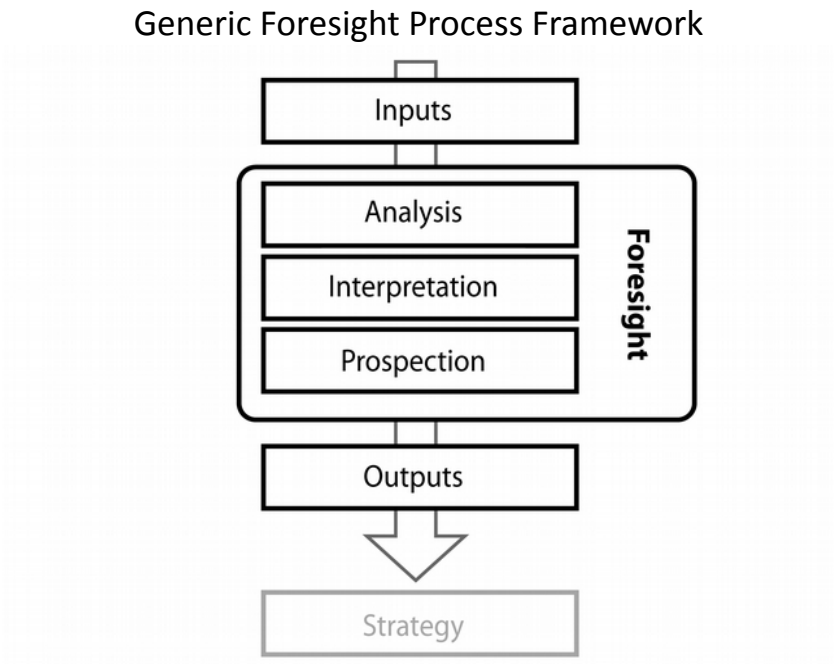

Figure 11. A generic foresight process comports inputs, analysis, interpretation, prospection and outputs. Reproduced from Voros (2003)

Our particular dual design process was circumscribed within a more general foresight process. For that we followed Voros's (2003) foresight process which comports inputs, analysis, interpretation, prospection and outputs. The inputs came from workshops with manufacturers when determining their existing business model. We organized theses workshops with manufacturers who are clients of the Institut de développement de produits (IDP), Based in Montréal, the IDP is a non-profit organization whose mission is to teach manufacturers how to improve their innovation practices. In all, 13 different manufacturing companies, mostly SMEs, were represented by 17 research and development professionals whom participated in our full day workshops. We choose to work with the 5 participant organizations that demonstrated the most interest in our research. We then analyzed the participating

manufacturer's business model and interpreted potential sustainability opportunities. In light of our analysis and interpretation of their current situation, we then entered the prospection phase by undertaking a design project to imagine concepts more sustainable business models. We followed up by brainstorming coherent service scenarios and then a product designs. For each case, we concluded the outputs by illustrating visually three types of outcomes: products designs, service scenarios and business models concepts. The resulting outcomes of our research protocol are presented in the following section that describes them as artifacts.

Workshop List

Workshop	Place	Public	Date	People	Companies	hours	Element
SSBMG-Ocad	Toronto	Research	February 18, 2013	15	3	2	Tool
Concordia	Montreal	Undergrad	March 20, 2013	55	0	3	Tool
UDM	Montreal	Undergrad	November 15, 2013	55	0	4	Tool
Concordia	Montreal	MBA	March 7, 2014	23	6	5	Tool
Desjardins-Excentriq	Montreal	Professionals	April 24, 2014	24	1	6	Tool
Desjardins-Excentriq	Montreal	Professionals	June 13, 2014	5	1	3	Process
IDP	Montreal	Professionals	June 17, 2014	5	4	1	Tool
Concordia	Montreal	Undergrad	September 25, 2014	50	0	2	Outcomes
IDP- EQ Montréal	Brossard	Professionals	October 29, 2014	5	4	6	Process
IDP- EQ Québec	Drummondville	Professionals	November 5, 2014	18	9	6	Process
UDM	Montreal	Undergrad	November 28, 2014	25	0	2	Outcomes
Concordia	Montreal	MBA	February 13, 2015	18	5	2	Tool
Cirodd	Montreal	Research	January 22, 2015	14	3	2	Outcomes
ICN intern. Bus. Sem.	Nancy	Undergrad	March 20, 2015	20	0	6	Outcomes
WUR	Wageningen	Grad +Start-ups	March 24, 2015	35	10	4	All
WISO	Hamburg	Grad +Start-ups	May 19, 2015	16	0	6	All
District 3	Montreal	Start-ups	July 12, 2015	40	9	2	Process
Inst. Nouveau Monde	Laval	Start Ups	August 14, 2015	18	6	3	Outcomes
Total				**441**	**61**	**65**	

Table 4. Complete listing of the workshops organized for our field research.

The third element of a design approach we seek to analyze is outcomes of the combined design processes in the protocol described above. In order to make the outcomes more tangible in the eyes of organizations, the designer/researcher derived from the business model concepts a service scenario and

a product design. For an example of each type of design outcome, one can refer to the results chapter.

Action research methods seek to predetermine the extent to which the research protocol can and should vary. Although some protocols systematically guide the researchers' intervention, our approach evolved depending on the relationships we build with the organizational participants. In preparation for these workshops, much of the researcher's time was spent on refining the tools to suit the requirements of the situation, then on collecting, analyzing, and presenting data on an ongoing, cyclical basis (O'Brien, 1998). Furthermore, as each new case was undertaken, the researcher's expertise was naturally shaped and improved. The finer aspects of the design approach evolved as the researcher learned to adapt to the context and the participants of each organization.

Another aspect that demonstrates rigour is the consistency of the tools that we used in our design process. In all accounts, the facilitator used the triple layered business model canvas to inform and support the design process. Because our focus was on the design approach that leads to organizations transforming their business models for sustainability, we remained highly collaborative and explorative with the participants in our protocol.

3.4 Research sample

We choose to orient our research for existing organizations because we see their transformation as more beneficial and more challenging than in the creation of cleaner start-ups (Hockerts and Wüstenhagen, 2010). The organizations were manufacturing small and medium enterprises of sizes ranging from 50 to 850 employees from the province of Quebec from varied industrial sectors. By working with clients of the Institute for Product Development as a consultant, we naturally selected manufacturing companies

who show interest for improving their innovation practices. Our sample was determined by the participating organization's willingness to explore business model innovation. Our final sample of at least five manufacturing organizations was opportunistic and thus allowed for flexibility (Patton, 2005).

Research Sample*

Organization	Position	Participants	Number of Employees	B2B	B2C	Energy Using product	Aesthetics oriented product	Long lifetime product
RainPipe	Marketing Director	1	162	x				x
Office furniture	R-D director	2	850	x			x	x
Paper Lamination	R-D director	1	75		x			
ProBeauty Products	R-D director	1	175		x		x	
Maverick bath products	Designer	2	254	x	x	x	x	x
Industrial Equipment	R-D director	4	328	x	x	x		x
Outdoor Lighting	R-D director	1	251	x		x	x	
Electrical Equipment	R-D director	2	185	x				x
Household Furniture	Engineering	1	122		x		x	x
Wood Flooring	R-D director	1	350		x		x	
Electronics measuring	Senior Engineering	1	1638	x		x		x
Roof Gutters	VP R-D	1	24		x			
Siding and Roofing	Marketing Director	1	135		x		x	

Table 5. Our research sample was determined by the participating organization's willingness to explore business model innovation.
**The names of the participating organizations have been changed to preserve their identities.*

3.5 Data sources

Our data sources came from the three elements of our design approach. Below, table 6 illustrates how these data sources can be linked to three different organizational levels. For the tools, we used post-its in the canvas tool and sketched concepts to create a narrative structure to tell a service story. For the process, we organized strategy workshops where we co-created business model concepts and then a foresight exercise that called upon design thinking to further these ideas through storytelling and service

design. For the outcomes, we resulted with business model concepts, services scenarios and product functions and in one case a physical prototype. Secondary data sources such as video recordings of the workshops, pictures of the participants in action, facilitator notes and group interviews with participants were also captured for documentation purposes.

Data sources

Elements of a design approach	Organizational levels		
	Strategic (why?)	Tactical (how?)	Operational (what?)
1. Tools	Canvas Pattern cards	Storytelling	Sketching Physical protoyping
2. Process	Foresight design workshop	Service design	Design thinking Co-creation
3. Outcomes	Business model concepts	Service Scenarios	Product functions

Table 6. A categorization of the different data sources that we have generated for each elements of a design approach according to each organizational level in our action research field work.

One important data source will be the resulting artifacts in the form of design outcomes. According to Rust et al. (2000), there are four means of generating knowledge from design artifacts:

> 1. Simple forms, where artifacts demonstrate or describe principles and techniques.
>
> 2. Communication of process where artifacts arising from a process make the process explicit.
>
> 3. Artifacts within research where artifacts are instrumental in advancing the research by communicating ideas or information.
>
> 4. Knowledge elicited by artifacts where artifacts provide a stimulus or context which enables information to be uncovered

In this action research, the data sources come from all four types of knowledge proposed by Rust et al. (2000). First, business model concepts create patterns or forms which can demonstrate principles and techniques for an organization to become more sustainable. Second, the concepts are distilled by going through a process. Third, the concepts become instrumental as they embody the considerations that went into their design. The fourth area of knowledge coming from artifacts is a concrete vision that can influence an organizations' transformation. This fourth aspect was little explored as we emphasized collecting data specific to our design approach and data for a longitudinal study on the ongoing transformation within organizations.

3.6 Data analysis

Here again we summarize our methods for each element of our design approach. For the first element, we share the theoretical foundation for the design tool we created. One could consider the creation of the canvas with the addition of 18 components on two layers represents an encapsulated form of analysis. Nonetheless, our main analysis focuses on the uses for the tool as we describe how it can be of value to organizations. For example, we discuss how the tool support new interpretations of business

model coherence vertically and horizontally. The second element on the design process analyzes the different results of both process that make up the complete foresight exercise. We compared the business model concepts and the business model patterns to analyze the strengths and weaknesses of the co-creation process and the design thinking process. The third element on design outcomes began with an analysis of the business model concepts to evaluate how they reflected the six principles of a sustainable business model as conceptualized by Stubbs and Cocklin (2008). We proceed to analyze how each concepts showcases a characteristic of a design outcome. And finally, we analyze how the three types of outcomes we created - business models concepts, service scenarios and product functions- align with three organizational levels - strategic, tactical and operational.

3.7 Research limits

Because action research is interpretative by nature, the role of the researcher in this study is effectively under consideration. There are many types of roles for researchers in action research such as an expert or a collaborator (Lüscher and Lewis, 2008). Here, the researcher plays both the role of the expert insuring the quality and effectiveness of the research design, data collection, analysis, and induction while maintaining a collaborative relationship by facilitating the activities with organizational participants. For example, in our protocol for the design process, we started the design researcher's intervention with a co-creation process with active participants. They were facilitated when outlining their current business model and imagining future concepts of their organizations. As mentioned by Luscher and Lewis (2008), "*participant engagement is critical to ensuring relevance*"(p.223). This dual process meant that the design researcher's outcomes were less limited by his biases while at the same time more pertinent as he became aware of the situation of the participating organization.

As the researcher is knowingly participating in creating data, action research provides a setting to take this bias into account. One strategy to avoid bias and misinterpretation throughout the study is to relate back to existing research referenced earlier in the literature review and the conceptual framework. Judgments and interpretations that arise in our upcoming analysis of the results have been grounded in past theory previously exposed in the first and second chapters. Secondly, considering the values, judgement and biases of the researcher inevitably influence the results of action research, we provide a short biography and an up-to-date curriculum vitae of the design researcher in Annex 2.

3.8 Research Ethics

There are different ethical considerations that arise because of the real world participative aspect of this study. The participants in our workshops have paid and chosen to be educated in the practice of sustainable business model innovation. It is important to specify that, because the participants chose to participate, they were able to simply refuse our invitation and services. In addition they all signed a consent form and ethics disclaimer as required by the University. It informed them of the context and their tasks. Again, no participant or organization was forced to take part in our study. On the other hand, it can be expected that the participants absorbed new knowledge from our design approach to sustainable business models. The ethical consideration is thus to make sure that the participants understood that our tools, processes and outcomes were exploratory. Our research protocol is by no means a well established problem-solving mechanism that leads to repeatable results. Hence, the participants were briefed to adjust their expectations in light of the exploratory nature of our research. The last point to consider with respect to our research ethics is the non publication of the name of the organizations. To allow for franc, open and critical conversation while feeling a creative freedom, we choose to preserve the identity of the participants and their organizations and we simply changed the

names of the organizations according to their products or industry.

3.9 Conclusion of the methods chapter

We have presented 8 elements of our research method with respect to our quest to insure the relevance of our propositions for three elements to constitute a design approach to more sustainable business models. We now propose a summary table of our research methods. In the following chapter, we exhibit the results of our action research.

Summary of our Research Method			
Research Question	**How can organizations undertake a design approach business models to be more sustainable?**		
General method	Action based research		
Epistemological Approach	We aim to contribute both to further the goals of science while simultaneously attempting to answer the practical concerns of our participants in their immediate problematic situation.		
1) Research Purpose	Meta: To guide organizations in the explorative phase of their transformation towards a more sustainable business model. Micro: To demonstrate the value of the three elements of a design approach: tools, process, outcomes.		
2) Unit of analysis	Design tool	Design process	Design outcomes
3) Research protocol	Exploratory workshops and expert advice were used to craft the design tool for imagining sustainable business models.	A foresight exercise built from two successive design process First a co-creation process was followed in a series of workshops with 19 participants. Then a design thinking process was added for 5 of the 13 cases.	Building on the previous protocol results, the designer/researcher derived from the business model concepts a service scenario and a product design.
4) Sample	13 Quebec manufacturing small medium enterprises from varied business sectors. 19 participants innovation professionals, clients of the Institute for Product Development 5 cases chosen for a design thinking process		
5) Data sources	Triple Layered Business model canvas tool	Co-creation and/versus design thinking	Business model concepts, service scenarios and product functions
6) Data analysis	We extract the various uses for the tool as we describe how it can be of value to organizations.	We compared the business model concepts to analyze the strengths and weaknesses of the co-creation process and the design thinking process.	Design outcomes were evaluated as following the 6 principles of sustainable business models. Then they were examined for common characteristics.
7) Limits	Limited by the researcher's own creativity and experience and by the will, openness and creativity of participating companies. Limited to the initial creative phase, not the implementation.		
8) Ethics	All participants were informed of their participation requirements and the exploratory nature of the study. All were enabled to opt-out. No names of participants or organizations have been published.		

Table 7. A synthetic review of the characteristics of research methods

Chapter 4. Artifacts Description and Evaluation

The description of the designed artifacts that resulted from this research follows our proposal of three elements of a design approach. First we expose the design tools we developed in our early workshops. The Triple Layered Business Model Canvas and the set of 24 business model patterns are the first artifacts that arise from our research. Second, we testify to the design process we undertook to arrive at more sustainable business models with the 5 organization cases. Because a process is intangible, we report on the artifacts that resulted of the process such as the current business model, the co-creation workshop concept and the design thinking business model concepts. We also contrast the different business model patterns that each process ended up choosing. Then, we validate that each business model concept can be considered a sustainable business model by using Stubbs and Cochlin's 6 principles as an interpretation tool. Third for the design outcomes, the artifacts we created are separated into three types of outcomes: business models, service scenarios and product designs.

4.1 Design tools artifacts

Presentation of the Triple layered business model canvas tool

The wide adoption and use of the business model canvas suggests it is a valuable approach for understanding and communicating an organization’s business model and for supporting business innovation (Abraham, 2013). And, if we expect organizations to adapt and become leaders in addressing sustainability challenges, then we need creative approaches to support those seeking sustainability-oriented innovation (Lozano, 2014).

We propose the Triple Layer Business Model Canvas (TLBMC) as a tool that can support the creative exploration of sustainable business models and sustainability-oriented innovation more broadly. Leveraging Osterwalder and Pigneur's (2010) business model canvas supporting economic value creation, the TLBMC introduces environmental and social value creation layers, overlapping the organizational components from the original canvas. These additional layers do not simply parallel the original business model canvas to explore environmental and social impacts separately, rather they intentionally draw connections within each layer and between the three to support an integrated triple bottom line perspective of creating organizational value (Glaser, 2006; Hubbard, 2009; Sherman, 2012) .To do so, we adapt an environmental life cycle approach and stakeholder management perspectives for the environmental and social layers, developing two complement sets of nine components for each new layer. These additional layers support a 'horizontal' coherence for exploring economic, environmental and social value individually and 'vertical' connecting the three layers. A three-dimensional approach to sustainability here supports a deeper and better understanding of an organization's value creation (Lozano, 2008). Through the TLBMC, we propose a way to creatively explore sustainability-driven product, process, and business model innovation which may help organizations to better address sustainability challenges. As the original business model canvas is treated at length by the original authors (Osterwalder and Pigneur 2010), we now expose the founding theory upon which we based the new environmental and social layers which make up the triple layered business model canvas (TLBMC).

Foundation of the Environmental layer of the TLBMC

Our organizing framework for the environmental layer builds on a life cycle approach of environmental impact. This life cycle approach is itself based on Life Cycle Assessments (LCA) which is a formal tool for measuring a product's or service's environmental impacts across all stages of the its life, from cradle to

grave. An LCA is considered a robust evaluation of environmental impacts as it takes into account multiple indicators of environmental impact (e.g., CO_2e, eco-systems quality, human health, resource depletion, water use cf., Hendrickson et al., 2006; Pennington et al., 2004 for more detail) over the full life-cycle of a product or service (e.g., from raw material extraction, manufacturing, distribution, use and end of life cf., Svoboda, 1995; Guinée, 2002). Prior work has shown that coupling LCA with business innovation can support competitive product, service and business model innovations with enhanced environmental characteristics vis-v-vis traditional business innovations (FORA, 2010) and which supports ongoing measurement and improvement of environmental impact to support continued sustainability-oriented innovations over time (Chun and Lee, 2013). We describe and provide an example of the nine environmental layer components in the case study below.

Foundation of the Social layer of the TLBMC

Our organizing framework for the social layer builds on a stakeholder approach to detail an organization's social impact (Freeman, 1984). A stakeholder approach to management seeks the maximization of the interests of all its stakeholders through an organization's actions, as opposed to simply seeking maximum gain for the organization itself. Stakeholders are considered those groups of individuals or organizations which can influence or is influenced by the actions of an organization. Typical stakeholders include employees, shareholders, community, customers, suppliers, governmental bodies, interest groups, though others advocate expanding stakeholders to include groups such as media, the poor, terrorist groups, and even non-human actors such as natural ecosystems (Miles, 2011; Post et al., 2002; Hart and Sharma, 2004). We have been inspired by a number of approaches for addressing social impacts in business such as social life cycle assessments (Jørgensen et al., 2008), ISO 26000 and other common standards (Pojasek, 2011; Moratis, 2011), and social impact factors (Benoît et al., 2010)

Although, they do not all build from a stakeholder perspective, we see promise in the future of these approaches along side with a stakeholder approach to allow for a more quantitative measurement of performance. Until then, we have chosen to extend the original business model canvas through a stakeholder approach to develop the social stakeholder layer canvas. Simply put, the notions and concepts contained in the original business model canvas have been filtered out through the perspective of a stakeholder theory. However, given that an organization's particular stakeholders may vary based on context and salience (Mitchell et al., 1997), we intend for the stakeholder layer to be more flexible and allow for greater interpretation of what needs to be measured. In the next section, we define the components of each canvas layer and illustrate its use through a case study.

Elements of the TLBMC layers through Nespresso's business model

To explore the two new layers of the canvas, we propose to continue using the business model innovation case of Nespresso, a coffee capsule provider. As illustrated in the original business model canvas in figure 6, the Nespresso business model begins with the quest to sell high-end restaurant quality espresso at home. (Osterwalder and Pigneur 2010, p.236). They sell individualized coffee cups at high margins while making smaller revenues from selling machines that were manufactured by partners. On the other hand the costs associated with activities such as marketing, production and logistics and with resources such as their distribution channel, their brand, their production plants and their patents. Nespresso targeted the office market and affluent consumers by creating a membership club to ensure a longer term relationship with these customer segments. They distributed the machines in retail but the cups were ordered online, by mail, by phone and in boutiques. This is a clear example of creative approach to rethinking the business model of an organizations because according to Osterwalder (2013):

“It changed the face of the coffee industry by turning a transactional business (selling coffee through retail) into one with recurring revenues (selling proprietary pods through direct channels).”

The data we use in the subsequent two canvases comes from public information such as reports available online from Nespresso or its parent company Nestle. More specifically, the environmental layer relates the information provided in a full report by Nespresso (2014) which extracts the carbon footprint LCA data from a third party report (Quantis, 2011). The social layer data comes from their parent company's report on creating shared value (Nestle, 2014).

4.1.1 Environmental layer of the TLBMC

The same way of the original business model canvas outlines how profits can be generated, the main objective when filling out the environmental layer of the TLBMC is to understand the environmental impacts of the organization. Doing so allows users to determine where the organization’s biggest environmental impacts lie within the business model; and provide insights for where the organization may focus its attention when creating environmentally-oriented innovations. As mentioned earlier, environmental impacts can be tracked with multiple indicators. However, in this Nespresso case, we track environmental impacts in terms of carbon impact due to data availability. Leveraging a life cycle approach, we now define each of the nine components of the environmental layer of the TLBMC below and elaborate it using the Nespresso business model.

Functional value. The functional value describes the focal outputs of a service (or product) by the organization under examination. It emulates the functional unit in a life cycle assessment, which is a quantitative description of either the service performance or the needs fulfilled in the investigated

product system (Rebitzer et al., 2004). The difference between a LCA's functional unit and the functional value can be seen as one of usage. For example, the functional unit of the Nespresso LCA is a 40ml espresso cup, while the functional value is the total of these cups consumed by customers in a given timeframe such as a year. The point of defining the functional value is first to clarify what is being examined in the environmental layer; and second, to serve as a baseline for exploring the impacts of alternative potential business models.

Materials. The materials component is the environmental extension of the key resources component from the original business model canvas. Materials refer to the bio-physical stocks used to render the functional value. For example manufacturers purchase and transform large amounts of physical materials, where as service organizations tend to require materials in the form of building infrastructure and information technology. These service organizations also consume significant material resources in the form of assets such as computers, vehicles and office buildings. While introducing all materials into the canvas is not practical, it is important to note an organization's key materials and their environmental impact. For Nespresso, materials are first and foremost the coffee beans which represents 19.9% of its carbon footprint. The aluminum used for the capsules is also to be included in the materials of the life cycle as it represents 6% of the carbon footprint.

Production. The production component extends the key activities component from the original business model canvas to the environmental layer and captures the actions that the organization undertakes to create value. Production for a manufacturer may involve transforming raw or unfinished materials into higher value outputs. Production for a service provider can involve running an IT infrastructure, transporting people or other logistics, using office spaces and hosting service points. As with materials,

the focus here is not on all activities but rather those which are core to the organization and which have high environmental impact. For Nespresso, the industrial processes to prepare the coffee beans represents 4.5% of the carbon impact and the manufacturing of the packaging capsules represents 13.3%.

Supplies and Outsourcing. Supplies and out-sourcing represent all the other various material and production activities that are necessary for the functional value but not considered 'core' to the organization. Similar to the original business model canvas, the distinction here is between core versus non-core activities that support the organization's value creation. This can be considered in terms of actions which are unique to the organization and support its competitive advantage and those actions which are necessary but not unique (Porter, 1985) and may also be conceived of as those actions which are kept in-house versus those which are outsourced, though this can be not strictly accurate. Within the environmental layer, examples of supplies and outsourcing include water or energy. While they could come from in-house sources (local wells and on-site energy production), they are likely to be supplied by local utility companies. As such, many organizations have little influence in these areas unless they are willing to take more control over these actions through, for example, creating on-site energy and utility services. In the available carbon footprint data of the coffee cup manufacturer, most of the impacts of supplies and outsourcing such as the machines and cups were included in the use phase.

Distribution. As with the original business model, distribution involves the transportation of goods. In the case of a service provider or a product manufacturer, the distribution represents the physical means by which the organization ensures access to its functional value. Thus within the environmental layer, it is the combination of the transportation modes, the distances travelled and the weights of what is

shipped which is to be considered. As well, issues of packaging and delivery logistics may become important here. For Nespresso, distribution involves the shipment of coffee beans and, subsequently manufactured, expresso cups over thousands of kilometres with the total effect of representing only 4.6% of Nespresso's carbon footprint. Their distribution practices favour train over trucks. In addition, the products are packaged in cardboard boxes that represents 3.6% of their carbon footprint.

Use Phase. The use phase focuses on the impact of the client's partaking in the organization's functional value, or core service and/or product. This would include maintenance and repair of products when relevant; and should include some consideration of the client's material resource and energy requirements through use. Many electronic products incur use phase impacts when charging a device and using an infrastructure needed to support the network of users. This can outweigh production impacts (Nokia, 2005). As well, the line between production and use phase may not be clear, especially as organizations increasingly offer co-creation of services (e.g., user created content) and product sharing (e.g., car sharing) in lieu of more traditional product and service business models (Prahalad and Ramaswamy, 2004). For Nespresso, the use phase consists of three elements. First, a client's energy and water needs to prepare coffee adds up to 10.9%. Second, the machine use and production represents 7.8%. And lastly, the cup production and washing is the largest single element of the entire life cycle with 28% of Nespresso's carbon impact.

End-Of-Life. End-of-life is when the client chooses to end the consumption of the functional value and often entails issues of material reuse such as remanufacturing, repurposing, recycling, disassembly, incineration or disposal of a product. From an environmental perspective, this component supports the organization exploring ways to manage its impact through extending its responsibility beyond the initially

conceived value of its products. Increasingly governments are forcing organizations to address this through various substance restrictions (European Commission, 2012) and recycling requirements (Environment Agency, 2012). This can also be an opportunity for organizations to creatively explore new business models such as product service systems (Mont and Tukker 2006; Bey and McAloone 2006) and industrial symbiosis (Paquin et al., 2015). For Nespresso, end-of-life means addressing the impacts of its spent expresso cups consisting of spent coffee and aluminum. The capsules, the packaging and the machine in a mix of end of life scenarios that includes landfill and recycling adds up to 5.5% of Nespresso's total carbon impact. However, the cups can only be recycled if taken back to one of the 14 000 Nespresso dedicated collection points (Nespresso, 2014).

Environmental impacts. The environmental impacts component addresses the ecological costs of the organization's actions. While a traditional business model often summarizes organizational impacts primarily as financial costs, the environmental impacts components extends that to include the organization's ecological costs. Based on LCA research (Jolliet et al., 2003), these performance indicators may be related to bio-physical measures such as CO_2e emissions, human health, ecosystem impact, natural resource depletion, water consumption. Some environmental indicators can take the form of traditional business metrics still related to LCA (De Benedetto and Klemeš, 2009) such as energy consumption, water use and emissions. And, as with exploring an organization's financial costs, this provides an opportunity to explore where, in the organization's actions, are its biggest environmental impacts. For Nespresso, its environmental impacts can point to its largest contributor, the use stage with 46.6% of the carbon footprint.

Environmental benefits. Similar to the relationship between environmental impacts and costs, environmental benefits extends the concept of value creation beyond purely financial value. It encompasses the ecological value the organization creates through environmental impact reductions and even regenerative positive ecological value. From a sustainability perspective, this component provides space for an organization to explicitly explore product, service, and business model innovations which may reduce negative and/or increase positive environmental through its actions. For Nespresso, an example of this would be the 20.7% reduction in carbon emissions they achieved by redesigning the machines to be energy efficient. By evaluating environmental impacts with a life cycle approach in the business model canvas, we are able to move beyond generalizations and intuition to establish a firmer basis upon which to design more sustainable business models.

In figure 12, we demonstrate how a life cycle approach can be represented in an environmental layer as projected through the original business model canvas. The content provided inside the canvas framework has been extracted from the report available on the company's website (Nespresso, 2014) which recounts the third party life cycle assessment.

The Environmental Life Cycle Business Model Canvas Layer

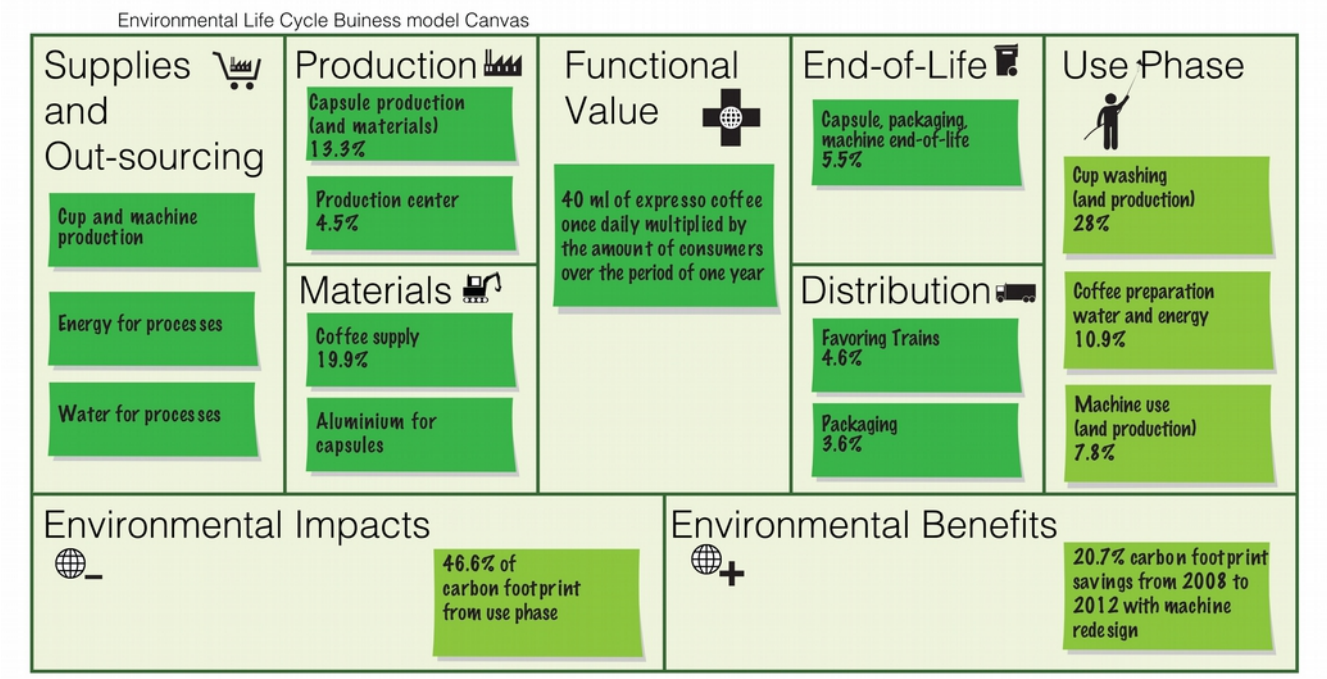

Figure 12. The Environmental Life Cycle Layer of the Triple layered Business Model Canvas with the Nespresso case content.

4.1.2 Social layer of the TLBMC

A key point of using the social layer of the TLBMC is to extend the original business model canvas through a stakeholder approach to both capture the mutual influences between stakeholders and the organization. Also, this layer seeks to capture the key social impacts of the organization that derive from those relationships. Doing so provides a better understanding of where are an organization's primary social impacts and provides insight for exploring ways to innovate the organization's actions and business model to improve its social value creation potential. Leveraging the stakeholder approach discussed

above, we determine the nine components of the social layer of the TLBMC and elaborate using the Nespresso business model.

Social value. Social value speaks to the aspect of an organization's mission which focuses on creating benefit for its stakeholders and society more broadly. For sustainability-oriented firms, creating social value is likely a clear part of their mission. However, even the most profit-oriented organizations likely consider their value creating potential beyond simply financial gain (Collins and Porras 1996). For Nespresso, they use the term creating shared value (Porter and Kramer, 2011). We can interpret their intended social value through their "roadmap for sustainable growth" (Nespresso, 2015) where one of their core competencies is developing long term value from mutually beneficial relationships with coffee farmers. A broader understanding of the company's social value can be extrapolated from its corporate business principles "to enhance the quality of consumers' lives every day, everywhere, by offering tastier and healthier food and beverage choices and encouraging a healthy lifestyle" (Nestle, 2014, p44).

Employees. The employees component provides a space to consider the role of employees as a core organizational stakeholders. A number of elements may be included here such as amounts and types of employees, salient demographics such as variations pay, gender, ethnicity, and education (to name a few) within the organization. As well, it provides a space for discussing how an organization's employee-oriented programs – e.g. training, professional development, additional support programs – contribute to the organization's long term viability and success. Due to the diverse aspects of employees, this components does risk overflowing with many data points of varying relevance for exploring an organization's business model. Thus, we focus only on those aspects which are most relevant for supporting the organization's business model. While data on this component it is not as explicit here,

among the issues worth considering based on Nespresso's goals are its rapid employee growth since its founding, that some 70% of its employees are customer-facing, its employees work in over 60 countries and themselves represent more than 90 nationalities (Nespresso, 2015). Given Nespresso's global reach and rapid growth, how to maintain a positive workplace and strong customer relationships likely need to be considered as a core part of its business.

Governance. The governance component captures the organizational structure and decision-making policies of an organization. In many ways, governance defines which stakeholders an organization is likely to identify and engage with and how the organization is likely to do so (Mitchell et al., 1997). Organizations can vary widely based on several aspects of governance including ownership (e.g., cooperative, not-for profit, privately owned for-profit, publicly traded for-profit) (Young, 2013), internal organizational structures (e.g., organizational hierarchy, functional v. unit specialization) (Williamson, 1991) and decision-making policies (e.g., transparency, consultation, non-financial criteria, profit sharing) (Philips and eCosta, 2007; Turskis and Zavadskas, 2011) and each of these points can influence how an organization may engage stakeholders in creating social value. As an autonomous business unit within Nestle, Nespresso has made a point of being transparent in decision making and actively engaging stakeholders to create value (Nespresso, 2014, p.1).

Communities. While economic relationships are built with business partners, there are social relationships built with suppliers and their local communities. These two stakeholders come together as communities when aligning the three layers of the TBLMC. When interacting with communities, an organization's success can be greatly influenced through developing and maintaining mutually beneficial relationships. If an organization has only one or multiple facilities located in the same geographical area,

then there may be only one local community. However, if an organization has facilities in different countries, it is important to consider each community as a different stakeholder with different cultural needs and realities. While organizations have tended to focus more on the community where they are headquartered (Landier et al., 2009), we consider community-organization impact for all communities where it has facilities as important.

Though individual suppliers may have more or less influence over an organization (Pfeffer and Salancik, 1978), as a group, suppliers are also critical as they provide the organization with critical resources necessary to support its success. For those organizations sourcing materials locally (say, for instance, a restaurant focused on the local food movement), suppliers are also part of the local community. For Nespresso, developing successful supplier relationships within coffee farmers is particularly important as Nespresso requires large quantities of high quality coffee. As a way to meet its coffee demands, Nespresso has partnered with the NGO Rainforest Alliance to train and support over 62 000 farmers in ways to sustainably improve their coffee quality and yields, which in turn increase their incomes (Nespresso, 2014, p.3).

Societal culture. The societal culture component recognizes the potential impact of an organization on society as a whole. Returning to the point that business cannot succeed when society fails, this component leverages the concept of sustainable value (Laszlo, 2008) to acknowledge an organization potential impact on society and how, though its actions, it can positively influence society (Steurer et al., 2005). Non-govenrmental organizations (NGOs) represent another element that can be included in the societal culture space as they carry social agendas through their influence on businesses. For Nespresso, one could argue that individual cup servings of restaurant quality points to a culture of individualism. On

the other hand, Nespresso's strong corporate social responsibility practices and programs can be interpreted as a culture of accountability and proactiveness.

Scale of outreach. Scale of the outreach describes the depth and breadth of the relationships an organization builds with its stakeholders through its actions over time. This may include the idea of developing long term, integrative relationships and the outreach of impact geographically – e.g,. local, regional, or global focus; as well as an organization's impact in how and whether it addresses societal differences such as locally interpreting ethical and or cultural actions across different cultures and countries. For Nespresso, the scale of outreach is represented by a growing company operating in over 60 countries with over 320 storefronts. Its outreach is also deep and diversified when creating additional social programs such as language education and micro-credit programs for its supply chain.

End-users. The end-user is the person who 'consumes' the value proposition. This space is concerned with how the value proposition addresses the needs of the end-user, contributing to his/her quality of life. Users with similar needs have typically been segmented based on relevant demographics – e.g., age, income, ethnicity, education level, etc. Importantly, the end-user is not always the customer as defined in the economic layer of the business model canvas. For instance, textbook publishers historically consider course instructors as customers though students are the end-users. For Nespresso, the end-user also happens to be the customer who seeks high-quality/low-effort coffee on demand in the economic canvas. In the social canvas, we can distinguish that Nespresso seeks to provide value by meeting the user's need in terms of taste, warmth and a caffeine boost.

Social impacts. The social impacts component addresses the social costs of an organization. It complements and extends the financial costs of the economic layer and the bio-physical impacts of the environmental layer. Although there is a growing body of work on social impact measures (UNEP, 2009), there is not yet a consensus on what social impacts to consider, nor how to quantify them. Some of the more common indicators as provided by Benoît-Norris et al., (2011) include working hours, cultural heritage, health and safety, community engagement, fair competition, respect of intellectual property rights; though which ones to focus on likely depends on the nature of the organization and an organization may find the need to create its own indicators here. For Nespresso, negative social impacts could stem from its engagement with local farmers, potentially disrupting or displacing existing cultural farming and social practices; or potentially the impact of caffeine addiction should perceptions change to consider caffeine a social ill as with tobacco, alcohol, and junk food.

Social benefits. Social benefits are the positive social value creating aspects of the organization's action. This component is for explicitly considering the social benefits which come from an organization's actions. As with social costs, social benefits can be measured using a broad range of indicators. For Nespresso, social benefits may include the personal development and community engagement impacts of providing training opportunities for its employees directly and indirectly with its coffee suppliers through its partnership with the Rainforest Alliance.

The Social Stakeholder Business Model Canvas Layer

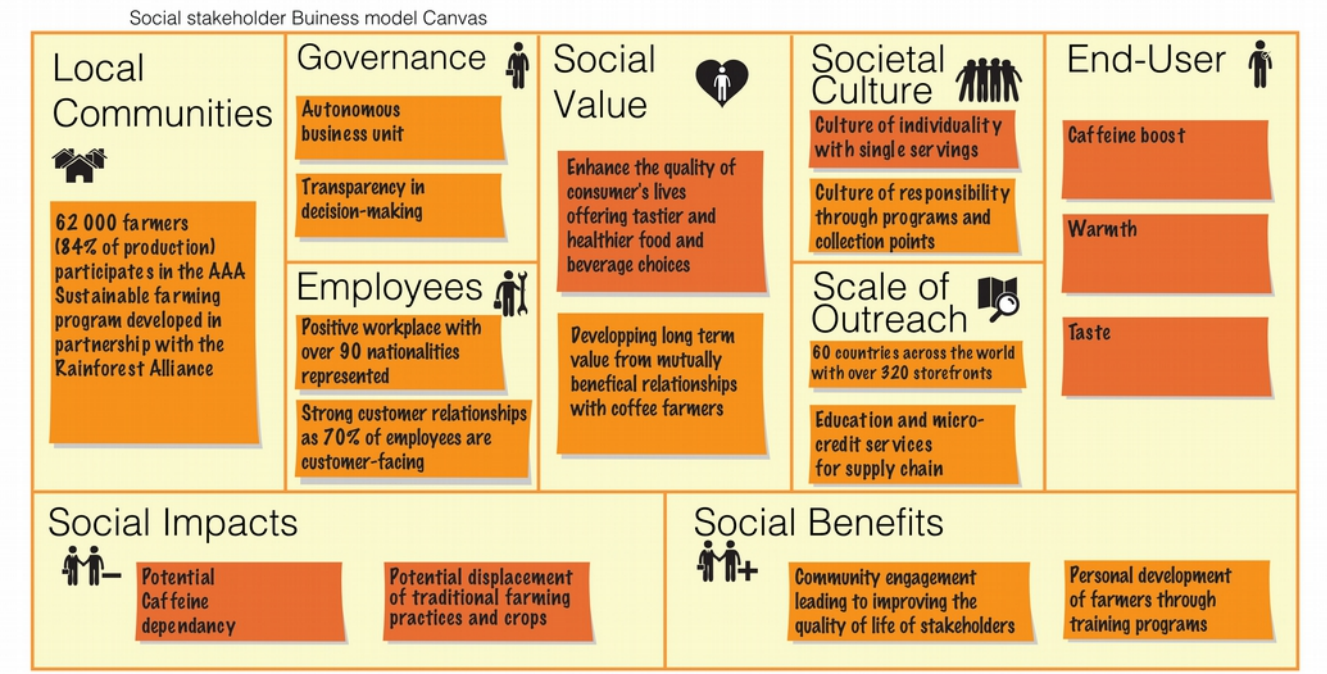

Figure 13. The Social stakeholder Layer of the Triple layered Business Model Canvas with the Nespresso case content.

4.1.3 Business model pattern tool

Business models are a rather new subject of research and discussion in management and design (Sommer, 2012). Moreover, business models are intangible which makes them difficult to recognize without a structure for understanding their patterns. As mentioned earlier, many of our participants were unaware of the existence of business model patterns and what they could be. That is why we used the triple layered business model canvas as a structure to describe a set of 24 business model patterns.

The form factor we developed for the patterns is a deck of colour coded cards. The economic related cards were blue, the environmental were green and the social were yellow. Each card had a definition of the pattern, it listed similar patterns, it visually demonstrated the areas of the canvas that were most

influential in the mechanics of this pattern and it concluded with a few examples of businesses that are known for applying this pattern. In the discussion chapter, we will share why and how the cards ended up being used by our participants. In the following figure 14, we reproduce the face of the 24 business model cards.

Business model pattern cards

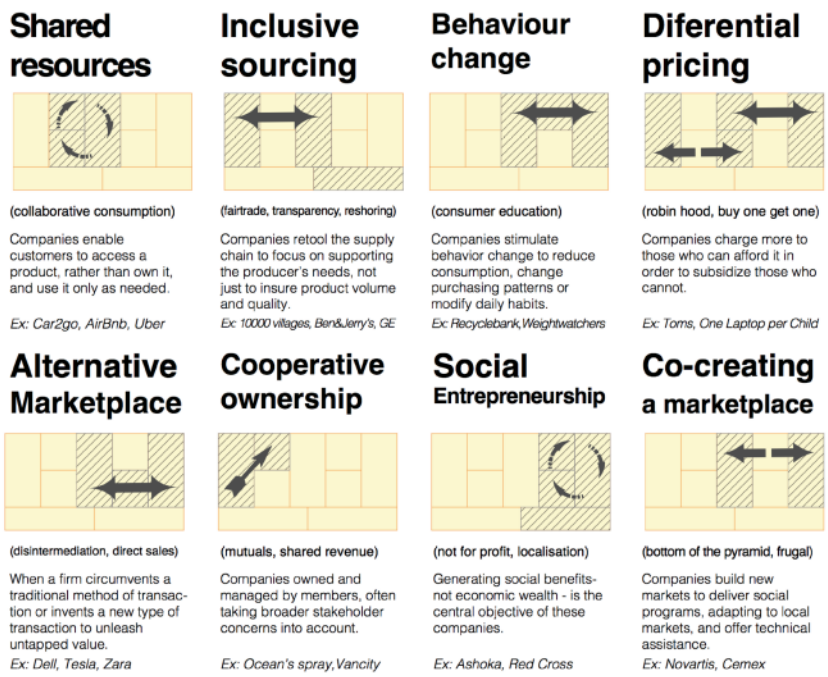

Figure 14. Accompanying design tool to the canvas, the 24 business model pattern cards serve as an ideation accelerator.

4.2 Design process artifacts

The first artifacts that we developed in our action research were design tools. The second artifact that we have crafted is a design process. This process was harnessed in the evolution of various workshops with participants (see Annex 3 for images). Unlike in previous design tools or the forthcoming design outcomes, the design process is an intangible artifact. We now share the evolution of the workshops we developed as a demonstration of our results with regards to the design process of more sustainable business models. In particular, we explored a dual design process that began with a co-creation workshop and then added a design thinking workshop. The following description exposes both design processes.

4.2.1 Co-creation design process

To describe the design process of the co-creation workshops we will first touch on the context. By context we mean the following aspects: preparation, time, participants, physical space, initial brief, what does the workshop not address, participants' reactions after the workshop, strengths and difficulties. Second we will describe the chronological evolution of the 18 workshops through our learning experience with each audience.

4.2.1.1 The contextual aspects

Preparation

The preparation for the workshops requires both a review of the intangible content and of the physical needs. As experienced facilitators, we make sure to adapt our content introduction to the audience. In the case of young entrepreneurs in start-ups whom are often familiar and with the business model canvas, we reduce the amount of theoretical and strategic content to provide more time for the participative aspects of the workshop. In the case of seasoned professionals in existing firms, we make sure to provide a 15 minute introduction to business models and the canvas to generate a common language. The more experienced in facilitating the workshops, the less dependant on projecting a presentation the introduction became. The introduction became simple discussion about business models that were then exemplified using the structure of the canvas. This enabled the participants to become proactive earlier in the workshops.

The other element of preparation that differs depending on the audience is the subject matter of the workshops. When providing a workshop for existing businesses or for start-up incubators, the subject matter of the workshop is the business for which the participants are currently working. In contrast, when invited to facilitate a workshop in university classes, special events or conferences, we need to prepare some case studies for the participants to work in small teams. The cases were chosen to be relatable and for many participants. The only information provided to the participants were screenshots of the first page of the business' website.

To vary the subject matter of the ensuing discussions, the researcher chose to vary the cases greatly from one group to another. Most cases were established Quebec manufacturing companies that ended up participating in the IDP groups. In the Hamburg workshops, the Quebec cases were “translated” into local cases with the help of the German host. A local bank, a cosmetics producer and a furniture manufacturer were used. To make sure the participants could find additional information in their native language, we provided the first page of their websites.

In addition to the single image of the website of the case, the other hand-outs to participants are the triple layer canvases in 11inx17in format and small post-it notes that fit in each box of the canvas. Lastly, the set of 24 cards are lent to the participants for the time of the workshop for they are more expensive to produce.

Time

In most workshops, time is a variable that is determined by the host. The average workshop time is 2

hours. The more time is provided, the more time the participants can work on their business models. In the case of a full day workshop, the participants are invited to share the results of their ideas with the group and a plenary discussion ensues. Inversely, when there is less than 2 hours for the workshop, the creative phase is either reduced to picking patterns or simply mapping out the current business model.

The co-creation workshops with the clients of IDP enabled a deeper dive into the exercise and time for analysis. The time frame was more expansive with two periods of 3 hours. As described previously in the methods section, the morning focused on the current business model and the afternoon was geared towards generating a creative and sustainable business model concept. The manufacturers were the participants with the highest amount of knowledge of their own business and fittingly they were the ones who had the most time to reflect and craft their multiple ideas into coherent concepts.

Participants

About 450 individuals participated in our 18 workshops. Their profiles range from green students to seasoned professionals. We can estimate that the majority of the participants were under 40 years of age. Both men and women were equally represented. Workshops were offered in French and in English. The one variable that was changing was the group size. The workshops averaged about 25 participants. However, the size of the group was always managed by creating more teams. With the large undergrad classes, we divided the group into 9 teams of 5 or 6. From our experience, the ideal groups for short 2 hour workshops are composed of three people. This allows for everyone to sit side-by-side at a table and be close enough to interact with the canvas. Also, three people is enough to create opposing views yet small enough to favour consensus and keep momentum to get through the exercise. In most workshops,

once the number of participants per team was indicated, the teams formed themselves. In very few cases when working with multiple existing companies represented by a single person, each representative would work on their own business model and share with others in their team.

Physical space

Most workshops were in a class room like setting. That means that the participants were sitting down in front of a table all facing in one direction. To create groups faster, the facilitator would point to certain rows of people and ask them to turn their chairs around. They would join those now facing them to work on a single table around the same canvas. In other cases, the physical space was a hotel conference room where the participants were seated in front of a table. The main idea is to have every participant seated at the table close enough to the canvas to be able to contribute ideas with her teammates.

Initial brief

The initial brief that was given to participants in the workshops varied depending on time, physical space, and subject matter. In most cases, the Nespresso case was used to provide an example and then the participants would emulate with either their own business or the case handed to them. This was repeated for each layer. The verbal cues to guide the participants in illustrating the current business model were suggestions along the line of:

- Use the sticky notes to write one or two or maximum three elements to describe each component of the business model.
- What you write for each component does not have to be perfect. It just has to be representative. If you can represent the component by sketching on the stickies, even better.
- Try to stay at a top level of strategic thinking. Try to be as simple and direct as possible. No need

to get in the details nor generate a long list.

- Try not to spend more than a few minutes at a time for each component.
- Here's the order in which to address the components of the canvas: Start by segmenting the clients. Then move on to the value proposition. Make sure there's a fit between both. Then find the intangible customer relationships and the often physical channels. Then go inside the business to share the key activities and resources. Everything that is outsourced or purchased requires a partner. Then add up the biggest costs. Try to find two revenue streams.
- Try to provide numbers or percentages for the bottom line or the impacts and benefits. There should be an understanding of how you generate profits.

When times allows it, we would walk back through each of the components and ask probing questions to make the participants reflect on their business model. We help them analyze the content they created and step back to see links and relationships amongst the components on each layer and amongst the components vertically. We guide the participants towards seeking a form of coherence. We then introduce the patterns and ask them to choose which ones best describe the current business model. We follow suit by looking back at the Nespresso case, and we ask the participants to be critical about what they believe could be improved. Recycling the capsules and the conditions of the coffee farmers are the most prevalent aspects. So we ask the participants to be as critical of their own business as they were with Nespresso. This usually raises the number of opportunities to improve their own business model. We suggest for the participants to transform that critical thinking into constructive creative thinking. We then ask them to choose amongst the other 7 patterns as a means to address the critical problems they saw. In retrospect, we should have captured the results of this critical thinking phase.

Then we asked the participants to be creative in redesigning their business model while changing the components that were most salient in each new pattern they choose. For example, a start-up could criticize that the adoption of their product is difficult in the face of competitors, they could choose to

explore freemium pattern which highlights to a new customer relationship in spite of generating initial revenues. For the creative phase verbal cues to the participants were:

- Make sure that your addressing big problems.
- The secret to a great business model is one that helps a client or user transform and grow.
- Seek win-win-win ideas. Where you can build and feed-off the relationships you build.
- Try to find three patterns that generate more coherence together.
- There are no limits to your imagination. Try to design the most fantastic business model concept.

What does the workshop not address

The workshop does not address past history or internal politics. It is an opportunity to imagine a positive future. Like renovations for a house, there are some parts of the organization that do not need to be addressed. For example, a company that has great quality control on their production line does not need to address this aspect in their future business model. For most participants, clarifying the business model of their organization is a first revelation. They had not seen the different components linked together as illustrated with the canvas. Because for many their current situation was a novel discovery for them, we believe that this hindered their capacity to imagine their business model even further in terms of ideals such as sustainability. We will discuss this further when speaking of managers in section 6.2.2.

Most of the problematic issues were dealt with as we went along in the workshops. For example, the lack of knowledge about sustainable business models was reduced with a short introduction, a clear example with Nespresso, the triple layered business model canvas. Then to help support a creative a approach which was also a problem we faced, we created the set of 24 business model patterns. This set

of cards not only helped the participants focus on certain aspects of their business models but also addressed another problematic issue which was time. Because our workshops were often within the 2-3 hours range, we decided to be more specific about what we wanted to accomplish during each workshop. As exposed in the workshop list of table 4 in section 3.3, each workshop was used to focus on a different aspect of our thesis that a design approach to sustainable business models entitles design tools, a design process and design outcomes.

As with much mainstream content or start-up discussions on the subject of a sustainable business models, some could interpret “a sustainable business model” as simply financially sustainable. Anecdotally, we found that amongst our participants the younger they were, the more implicit was the need for a triple layered approach to their business model. Inversely, participants in existing companies illustrated their current functional business model that might not require a sustainability overhaul. This raises the question: Why should organizations include sustainability into their business model?

There are many external incentives such as fiscal, legal or political regulations. There are also internal motivations for sustainability such as marketing positioning, human resources retention or health and safety benefits. However, this research in general and the workshops in particular did not address the incentives or motivations for sustainability. Therefore the participants choose to take part in our workshops and their individual motivations were not accounted for. We did not question the moral issues regarding the way business conduct themselves today. We did not explore “why” business models should be more sustainable but “how” they could be designed as such. Our focus as design researchers was to help participants envision a sustainable business model for their organization.

Participants' reactions

After the workshop, most participants are cheery and happy to have been active during the workshop. One participant, Mrs Sadikova a program officer at a large multinational put it this way: "I found the workshop content very useful and interesting and their manner of engaging and involving the audience effective." The same sentiment was shared by Mr Bushinelli: "I really appreciated content of the presentation as well as the hands-on exercise, where teams got to apply the knowledge they just learned using their own business models."

Finally, here's the feedback from a young student, Mrs Stolbikova: "Having attended many workshops in the past, I personally believe that this was one of the most interactive and educational workshops out there! I have previously taken a university course on the same topic: the creation of a successful business model. I have also read books on the same material. However, I feel that I have learned more in one afternoon than I have learned in three months at a prestigious university! It was a dynamic and fast-paced learning experience and the speaker kept our attention to the end."

In terms of content, the participants often shared how they were impressed with the simplicity of the tool, how it was useful to them, how they got a new perspective on their business. Last but not least, they feel that they learned how business models can be understood as more sustainable. For example, here is the feedback of Mr Tremblay an international business major: "I find the vision of Alexandre's sustainable business model is one that is helpful and easily applicable to everyone planing to or partaking in business development. To be able to contrast the effects of economic strategy with the social and environmental ones the way his model trains should be taught as an essential part of business

strategy today. His workshop provides you the tool to better formulate a sound business plan while emphasizing how strategy around the three spheres may help your company innovate and become a leader in your domain." A similar feedback was expressed by Mr. Pezzini a graduate student: "Alexandre's workshop "Building a Sustainable Business Model" was very relevant and inspiring. The tools provided a solid structure to analyze and transform business models through sustainability-driven innovation. I particularly appreciated the connections between the traditional business model canvas and the life-cycle thinking as well as the social performance. This will prove useful in structuring my strategic thinking when analyzing or building innovative business models for a low-carbon economy."

Strengths

The main strength of the workshop is, in our opinion, the participant's engagement levels. We did not focus on this aspect at the outset and we did not seek to measure it quantitatively. However, we can assess that the participants were pleased with their experience from the qualitative feedback we gathered and shared above. Another indicator of participant engagement in the content is the frequency with which we were asked for a copy of our short presentation, and more importantly, an electronic copy of our design tools. There have even been some cases where students or start-ups used our tools on their own a few weeks later. They wrote to us and asked for feedback on their ideas.

Another important strength of the workshop lies in raising the awareness of the complexity of more sustainable business models. The broadening of the participants mindset transforms added complexity into potential opportunity. This happens by providing a more holistic perspective and subsequently raising the strategic thinking level of the participants. For example, some participants were initially

focused on designing a minimum viable product, pinpointing the right market, finding the next big innovation, or solving a single environmental issue. First, the workshop process and the tools enabled the participants to see the bigger picture and acquire a holistic perspective of their business. This was done by combining a triple bottom line approach to a business model approach to organizational thinking. Second the workshop enabled the participants to think at in a strategic way by seeking coherence amongst the relationships at play in the 3 layers and the 9 components of a business model. We will return upon this subject of organizational levels of thinking in the discussion about outcomes and decision levels in section 5.1.3

Difficulties

The biggest difficulty for the workshops was moving past understanding the mechanics of business models and into a creative approach to begin imagining new ideas. Although many participants already knew the structure of the business model canvas and many more had heard of a triple bottom line. Working with the triple layered business model canvas required a high level of mental energy from the participants. Again, they had about an hour to understand the structure and put it to use by describing the 27 parts of their business model. The participants of 2 hour workshops shared how they could feel in rushed to fill out there canvas. From a facilitator's perspective, this is to be expected when we focused some workshops on the creative aspect. We wanted to make sure the participants had an experience with the canvas before moving into the creative phase. In retrospect, we could have provided a case having already filled out the current business model. The full workshop would then solely be on imagining a new business model with the help of the pattern cards like was the case with Desjardins' second workshop.

The Nespresso example used in the workshop directly demonstrates what content is expected from the participants. However, some teams did not understand how to physically use the canvas and the sticky notes. Some participants began by writing directly on the canvas even though they were instructed to use sticky notes. They were invited to use the sticky notes for two reasons. First, the first idea that is written down can be improved or better worded. Second, the content upon further reflexion might be better suited in another space. The sticky note can thus be taken and placed on a different component of the business model. For example, an internet website can be a channel if the customer can browse through the products and purchase online. However, the same website could also host a blog that generates a conversation with potential customers and thus the blog is a customer relationship. In this case, we suggested to create two different sticky notes where the channels was the online store and the customer relationship was the blog.

As mentioned in the introduction of this thesis, one of the motivations for this research came from the researcher's past experience with professionals unable to imagine a sustainable business model for their company. Even though the co-creation workshops were set within a context for blue sky thinking and favouring crazy sounding ideas, the participants did not surprise the researcher with their business model ideas for sustainability. This confirmed our intention to add-on a design thinking workshop in addition to the co-creation workshops.

4.2.1.2 Chronological Evolution

When looking back at the 18 different workshop sessions, we see that there was three different focuses

in the co-creation workshops. The first wave of preliminary workshops attempted to validate the canvas tool and the pattern cards. A second portion of workshops with professionals were geared towards co-creation and building case studies for an additional design thinking workshop. The final workshops refined the delivery and the use of the tools. We now look at each group in greater detail as they each revealed a particular insight.

1st wave: Tool validation workshops

The first few workshops were geared towards validating the design tools. In order to have a broad and diverse range of feedbacks, workshops were organized in different settings, with different participant groups. Within this first wave of workshops, there were four different types of participants: Researchers, university students, a large service cooperative and industrial manufacturers. We now look to how each group influence the tool validation process.

Researchers

The very first workshop was part of a 3 day seminar on sustainable business models held in Toronto at the Ontario College of Arts and Design. The dozen or so participants were mostly university professors and some expert consultants. All shared an interest in research on sustainability for organizations. We were offered a 2 hour workshop to test the triple layered business model canvas and then discuss its strengths and weaknesses as a design tool. We divided the 12 experts into 4 teams of three or four people and had them attempt to recreate the Nespresso business model case. We had prepared 27 pieces for the 27 places on the triple layered canvas in a puzzle-like exercise. In this type of workshop, the participants did not have to create any content, they only had to discuss what aspect of Nespresso or

piece of the puzzle represents an element of the business model canvas. For example, the farmer piece represents the community in the social canvas. This allowed for the participants to focus on the tool itself and not debate about what content should be created. The feedback we received was that these advanced researchers wanted to integrate the “embedded” notion of sustainability (as described in figure XYZ in chapter 1). Instead of having three equal layers, the researchers would have preferred a single, all encompassing tool. On the other hand, a professional consultant expressed the value of focusing on one layer at a time. In all, they described the tool as highly functional as they were able to quickly map out and discuss an organization in terms of a triple bottom line approach.

University students

The following group of participants were undergraduates and graduate students. Some were studying design, others management. An average of 50 students were split into 8 teams of six students. The 2 hour workshop was set within a sustainability course in their respective programs. We prepared the same puzzle like exercise, but this time we added a creative task. Once the 27 pieces were placed onto the canvas, we shared our version of Nespresso's triple layered business model. As the workshops with students multiplied, the Nespresso case was becoming an example to explain the mechanics of the canvas. Then, we asked the groups to come up with new business model ideas. They were asked to substitute pieces of the puzzle by writing new ideas of actions on blank pieces. They then shared their ideas to the group. Our thoughts on this series of workshops was that the students had a hard time to grasp the mechanics of the business model in the first place. Therefore it was difficult for them to be critical and decide what part to change. One participant shared an analogy of this issue as to open the hood of a car and be asked to change a part of a working engine. This became the first manifestation of a

need for creating pattern cards in order to complement the canvas tool. Moreover, the participants were more interested in creating new business models than criticizing the canvas structure and categories. In the last workshop of this series with university students part of the MBA program, the participants were invited to represent their own business on the canvas. This was partly a step back because it took so much time to get an understanding of the current business that we did not have much time to get into the creative aspect of imagining a future business model. At that point, the business model cards were being created and they would be ready for the next group: a large service cooperative.

Large service cooperative

Desjardins, a banking cooperative with over 45 000 employees, invited us to host a workshop for their multidisciplinary group called ExcentriQ. There were 40 professionals with various backgrounds such as investment banking, customer service, sustainability and change management. The participants were divided in 8 teams of 5 people. This 90 minute lunch time workshop began by exposing the Nespresso case content to serve as an example of how the canvas tool can work. The groups were given one of four client focuses: Business clients, insurance buyers, individual members and investment buyers. The teams were given sticky notes and asked to quickly fill out each layer one at a time using their knowledge of their company. After each layer, we asked each group to share their business model. And the we discussed in plenary the strengths and weaknesses of each layer of the tool. The participants stated that their banking business was more difficult to portray in general and particularly with the environmental layer because it was intangible and because they work in silos. Some said that the social layer was easier to fill out because it allowed them to put forward the cooperative and societal mission where as that would not have been possible only in the economic layer. A discussion ensued about the link between

the economic and social angles by which communication-marketing efforts reach client members. In this first workshop with Desjardins, we only had the time to ask the participants to change one sticky note per layer. We did not take out the pattern cards as we used them to invite the participants to another workshop.

After having mapped out the current business model of the financial institution, a second follow-up workshop had for objective to create visions for future business models. Only 8 of the 40 participants were available or willing to take part in a second workshop during office hours. We began by reviewing the content created in the first workshop and we added new ideas and questions in terms of feedback. In this second workshop, it was the first time that the pattern cards were used with participants. The 24 business model pattern cards describe different business strategies and name a few examples. There are 8 cards for each of the three layers. The first use for the pattern cards was to express the current business model pattern of the cooperative. After a short explanation of each card, the team choose one card for each layer. Then, the team was asked to brainstorm a few ideas about what the future of the cooperative could be. This open space for ideas was so rich that we got sidetracked. We had too many ideas. So we asked the participants to choose a card from the remaining 7 cards for each layer. The team selected not 3 but 5 cards. They were able to combine business model patterns to fit their multiple ideas. The session ended with a few projects on the canvas without a clear coherent concept. The feedback from the participants was mixed. There was little to say for the environmental layer as they did not feel it was a core issue for an intangible service like a bank. They felt like they had the chance to diverge in the brainstorm phase, but there was little time for convergence into a single business model concept they could begin to work on. Inversely, the patterns opened their eyes to business opportunities and the ideas they came up with were novel.

At the end of this workshop, we had realized the strength of the pattern cards. They enabled us to move into an abstract understanding of the business model. We explained this with the analysis-synthesis gap by Dubberly and Evenson (2008). We now refined the use of the patterns cards with our main audience: industrial manufacturers.

Industrial manufacturers

The next series of introductory workshops were a preparation of bigger events hosted by Institut for Product Development (IDP). We had 2 hours to test and refine the canvas and pattern tools with a few groups of manufacturers. This was also a means for the IDP to test the facilitator's preparation and the pertinence of the workshops because the IDP wanted to insure the next round of full day workshops with advanced manufacturers would be a success. By now, the content of the canvas tool and its use was mature. The content of the cards were also mature, but the use of the cards was still in need of refinement.

The flow of the subsequent workshops would be the following. Introduction to the economic canvas with the Nespresso example. In parallel, the participants would describe their own economic business model. This took advantage of the fact that many participants already know Pigneur and Osterwalder's canvas. Then, we would introduce life cycle thinking and the Nespresso case on the environmental canvas. The participants would emulate with their own case. The social stakeholder approach and Nespresso case were described on the social stakeholder canvas. After the third part of this example, the participants would also fill up their canvas with post-it notes. In about an hour and quarter, the participants had filled the 27 elements of their triple layered business model canvas. The facilitator then

described what a business model pattern is following the definition by Alexander (1977): “describes a problem which occurs over and over again in our environment, and then describes the core of the solution to that problem, in such a way that you can use this solution a million times over, without ever doing it the same way twice.” This quote was intended to deter participants from attempting to replicate the pattern without adapting it to the context of their organization. This was the spark that would open the minds of the participants to the idea of using a business model pattern to creatively approach the design of their own business model.

The feedback collected was in line with the previous positive comments from students and researchers. The reoccurring wish was that the participants would have liked to have more time to think about the future of their business.

In retrospect of the 1st wave of workshops, we realized that our design process moved in 4 phases. This process is clearly explained by the 4 boxes of the analysis-synthesis bridge model by Dubberly and Evenson (2008).

The Analysis-Synthesis Design Process

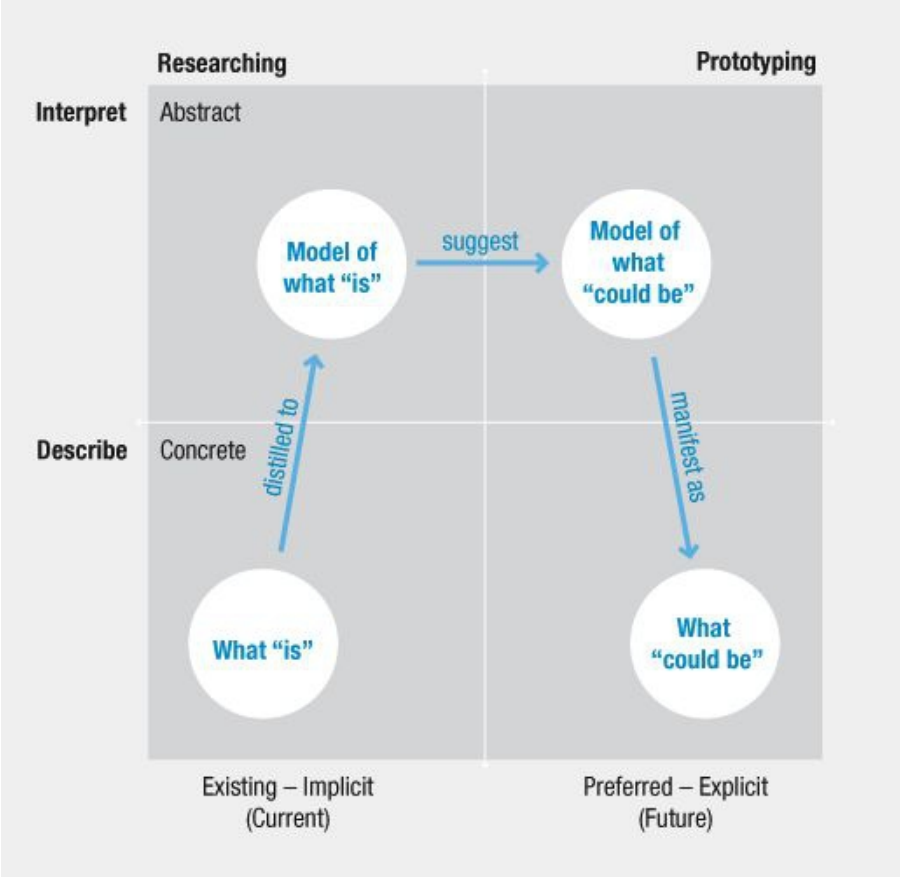

Figure 15. The 4 step design process to bridge an existing situation towards a preferred future.

Reproduced from Dubberly and Evenson (2008)

First is a description of the current, existing and implicit situation: “What is”. In our design process, the current business model on the triple layered business model canvas. Second is an interpretation of the current situation in the form of an abstract model: “Model of what is”. In our design process, the current business model patterns that represent the current business model. Third is an interpretation of a future, preferred situation still in the form of an abstract model: “Model of what could be”. In our design process, the new choice of business model patterns that represent a future business model. Fourth is a description of a future, preferred situation: “What could be”. In our design process, the adapted triple layered business model canvas according to the choice of business model patterns.

This realization enabled us to move into the 2nd wave of co-creation with more confidence about the design process.

2nd wave: co-creation for case studies

Once the tools had been successfully used with a small group of industrial manufacturers, we felt they could be used in a larger group for a longer workshop. This second wave of workshops was a means to gather a few case studies. These first co-creation workshops would become the first part of our design process. The second part of the design process is a design thinking process which is described later.

There were two co-creation workshops with groups of advanced manufacturers. By advanced, we mean that these organizations are mature in their innovation practices and they are pro-actively seeking to continuously improve them. Moreover, they were all members of the Institute for Product Developement. The two groups were divided geographically. The first group of 5 business were from the Montreal region and the second larger group of 18 were from the rest of the province of Québec. These

two workshops followed much of the same progression as described with the industrial manufacturers in the last workshops of the first wave. As for every workshop, some variables were adapted to the public. The most important variable that changed was this group of participants were allotted more time for each step of the workshop. Instead of a 2 or 3 hour workshop, this was a full day exercise of 6 hours. Some participants were alone in representing their organization, so we had them work in teams of three. In the morning, they worked on their own business model at first and then shared and improved with their teammates' ideas. In the afternoon, the creative phase was a team effort in co-creation. This was the first time that the participants were invited to work on each other's cases. This is when a vision of a more sustainable business model was imagined for each organization by each team.

Although we will discuss the outcomes of this co-creation exercise in the next section, we can state a few findings here about the results of the process. Our initial impression that manufacturers would have a difficult time in creatively thinking out of the box in terms of business models was highly reduced with the help of the tools and the process. Although we do not have a systematic means of comparison with the first wave of workshops, we feel that the business model concepts that came out of this second wave of workshops were more original and coherent. In terms of the process, the participants moved through the 4 steps of analysis-synthesis. That is to say that (1) they described their current business model, then (2) their current patterns, third (3) they suggested three new patterns and (4) proposed a future business model. We see this design process as the main factor that enabled the participants to arrive at new business models concepts towards sustainability.

Of the 13 participating companies, five requested a follow-up workshop with the remainder of their

innovation teams. This additional workshop was not part of this action research as it was focused on answering the present needs of the business. Each organization had a different objective that did not necessarily equate with our research objectives. Nonetheless, the private workshop became a means to keep the conversation going with the professionals and to gather their feedback on our additional design thinking process. We were still somewhat disappointed with the participant's ideas of what could make their business model more sustainable but not radically more sustainable. Although the design process did demonstrate the capacity to guide the participants towards more sustainable business model concepts, we did find that their concepts could be further reaching and more inspirational. This reaffirms our belief in the need to add a design thinking process to the co-creation process. This design thinking process will be detailed after exposing the 3rd wave of workshops.

3rd wave: Perfecting the workshop delivery for creativity

With 5 of the 13 businesses who participated in the co-creation to become the base of our case studies, we began a design thinking process. In parallel, we never stopped hosting workshops in what we are calling a 3rd wave. Now that we had understood and experienced that the core of our design process and co-creation workshops relied on moving through the 4 steps of analysis-synthesis, we explored new means of tweaking the workshops to favour creative results. Our research was getting some exposure in our networks and we were invited to give workshops for a 2nd time in undergrad and MBA courses, in Europe and with start-ups. These three audiences form the 3rd wave of workshops.

2nd time in undergrad and MBA courses

The university teachers for whom we had prepared workshops in 2013 were eager to invite us for a

second time with 2014 cohorts. Again, we had designers, MBA students and graduates interested in sustainability research. This time however, the focus of the process was mostly on providing richer, more creative outcomes. The designer teams were invited to sketch product ideas while concurrently working on business model ideas. This made for vivid descriptions of the concepts and even generated a snowball effect of creativity. Once one idea was sketched by one teammate, this led to a second interpretation by another teammate. Who, in turn, sketched another version of the idea which sparked a third interpretation. For more research on the power of sketching for creativity see (). Moreover, the sketching of ideas and business model components also enabled sharing this content with the rest of the participants. This made the conclusion of the workshop more engaging for the rest of the audience. This experience with the designers comes in sharp contrast with the graduate sustainability researchers who were invited to sketch but only participant did. On the other hand, the sustainability oriented groups did have deeper ideas in connecting the social, environmental and economic aspects of a business model. Anecdotally, we report that they were more attuned to finding vertical coherence amongst the three layers of their business models. Their choice of business model patterns was taken to better align all three business model patterns. This was perceivable when they would choose a dominant business model pattern and then adapt their choices in the other layers to fit with this dominant pattern. For example, one team had chosen a razors and blades pattern for the economic layer. Then, once they had chosen resource stewardship and social entrepreneurship, they went back to the economic layer and chose a pay for success pattern. When it comes to the MBA students, we wanted to compare different tools towards more sustainable business models and get insight into what could favour more creativity. This MBA group was presented with the triple layered business model canvas and with the future fit business model canvas which was derived from the strongly sustainable canvas by Upward (2013). Though we had little time to properly use the pattern cards, we learned the canvas tools do influence the

portrayal of the current business model. The small differences in the components of the canvas made for much of the ensuing discussion. But the main learning point was that without the pattern cards, there is not a notion of abstraction, no matter the canvas components. This reaffirmed our experience in the first wave of workshops when we were developing the pattern cards.

European workshops

In the spring of 2015, we were invited to give workshops in France, the Netherlands and Germany. The participants in these workshops were business students mostly in their mid-twenties. This was an opportunity to get a feeling for the cultural influence of the participants on the ideas. In short, the participants were more familiar with product-service systems as described in our introduction in chapter 1. The researcher informally polled the students as to wether they had used a product-service systems other than in the mobility sector with bike or car sharing. Some participants could name tool sharing companies, clothe washing services and even original community-based banking business models. When it came to the workshop, we had the students work on the business model and then expose the service in a short twelve scenes scenario. Some students surprised the researcher as they interpreted this exercise as an advertising campaign. Others were more straight forward in telling the story of their business model without attempting to persuade purchase. In contrast with a previous workshop with non-designers, many of the teams did sketch their ideas. But they were not focused on sketching a product, but on a scenario. And they sketched their scenarios to later search for similar images on the internet that conveyed the same idea. In the end, these workshops with young Europeans did provide richer concepts. Both the visual content was engaging in the form of scenarios presentation and the business model content was influenced by their experience with product-service systems. To be fair, we

did shorten the first two steps of the analysis-synthesis of this design process to put more emphasis in these workshops on the 4th and final step of describing and expliciting the future.

Start-ups

With this final groups of workshops in the 3rd wave of workshops, we continued tweaking the workshops to generate more traction and complicity with our participants. From our European groups we learned to put more emphasis on the creation of future business models. For this we begin with a blank slate and we do not refer to the existing business model. This approach was tested with start-ups which happens to be a favourable audience because they are currently experimenting with their business model and thus they do not have a feeling that they are breaking something that already works. For the first 10-15 minutes of the workshop, we had the participants answer broad questions on post-it notes. Questions such as: “how is your business going to change the world? What transformation are your trying to help people with? How will you measure the success of your business non-financially? What kind of values are important to your community?” Because today's start-ups are all familiar with the business model canvas, we started the discussion with the social layer. More importantly, the participants did not know that the answers to our questions was populating the social stakeholder canvas. They were then invited to take their sticky notes and place them on a large poster on the social layer. They perceived the links themselves as we moved on to the economic layer. Some were taken aback when they tried to fill out the economic layer now knowing that their economic business model was a means to their ends of a social business model. In other words, the researchers through the experience of the participants learned that the “why” or the purpose of their business model should first be of a social value or benefit to stakeholders before becoming an economic value. This opens up a

whole new avenue for research that we had not anticipated. We began this research with a common understanding that the three layers of a business model are of the same importance. But when starting with the social layer as with this last group of start-ups, we learned that there could be a different interpretation of meaning associated to each layer depending on the intention of the participant or the goal of the business.

4.2.2 Design thinking workshop

The second aspect of the design process we tested in this research was a design thinking workshop. As a starting point, it builds on the content generated during the co-creation workshops with the 13 industrial manufacturers. After those co-creation workshops with the innovation professionals, the IDP team contacted each participating business to see if they would be interested in a follow-up. Five of the thirteen organizations choose to undertake an additional business model innovation workshops at their offices. Because the researcher would maintain contact with the interested participants, they became the participants for the second part of the process: the design thinking workshop. In all, a total of 5 design thinking workshops took place. Each followed the 5 steps of design thinking as expressed in chapter 2.4.2. which are: Empathize, Define, Ideate, Prototype, Test. We will now describe what was done by the researcher for each of these phases.

Emphathize

The design thinking process begins where the co-creation process ends. That means that the documentation of the co-creation process was the first step. We took pictures of the canvases the co-creation participants created, the pattern cards they choose as well as the observations they wrote on

additional sticky notes. We also listened carefully to the participants' presentation of their sustainable business model concepts to denote the emotional undertones. We were sensitive to the enthusiasm they demonstrated as they described certain parts of their model or when relating why they had chosen a certain business model pattern. All this content served as a means to understand where the business was starting at. We were conscious of the struggles of the business and started our design process from their point of view.

Define

Once we had gone over the co-creation experience of the participants with an empathic approach, we defined the problem for each case. We were asking ourselves questions like: What are the pains or concerns for this business? For their clients? What is the biggest environmental or social impact they are or are not considering? What opportunities are they targeting or missing? How forward thinking are their ideas? Does their concept seem plausible in 1-3-5-10-15 years from now? We did not formally answer all these questions for each case but this type of analysis led to defining a new vision for each case. This step is partly analytic as we have just expressed through our probing questions but it is also intuitive. The researcher is subjective when critical about one aspect of the business or when pointing towards an opportunity for the future. Another design thinker could, and most probably would, come up with another avenue for improvement. The researcher's intuition is based on knowledge, experience and empathy for the business. With that in mind, the design researcher began to define the problem of the current business model. For example, in the case of PaperLam, the design researcher assessed that the problem lied in that cardboard material is a commodity with little value added. The vision for the future would attempt to tackle that issue.

Inversely there were some cases where ideas appeared during the definition stage. Its difficult to refrain creativity. We would write the idea down for the next step, but we would take a step back to better understand what problem that idea was trying to answer. For Offurniture, the idea of a leasing business model came up. However, this was not necessarily a problem and it was far from being on the company's radar. So we back tracked and saw material efficiency as an ultimate goal and the problem became finding the steps that would bring the company there. The problem for Offurniture was that the product was physically durable but not emotionally durable and that did not generate new revenues over time.

Ideate

The ideation phase could be expressed as three steps: reaffirming the problem, bridging towards a solution and deepening the concepts. The first step of the ideation process overlapped the end of the definition phase. By that we mean that in some cases, as the problem became clearer for each case, the solution was also forming. The business model patterns cards were very useful at this time to generate a bridge between the problem and the solution. By identifying the pattern card that could best answer a problem, we began shaping a vision for the solution. Choosing the business model pattern for the other layers of the canvas also helped create a clearer vision. For example, the idea of generating electricity from the rain pipes (i.e. the substitution with renewables environmental business model pattern) came early in the process as a large opportunity to address.

For other cases where the problem and the solution where less intuitively tied together. The ideation phase was separate from the problem definition. For example, in the Maverick case, the problem was

defined as a lack of connection between personal hygiene and water consumption. However the solution to this problem did not raise an obvious solution avenue. A creative brainstorming was required in a second step of the ideation phase.

This second ideation step took on the form of brainstorming conversations. The researcher enlisted the help of two designer friends. The brainstormings were very informal. The researcher exposed the problems and initial vision for each case in very broad terms without visual aids. The design researcher open the floor to ideas. And a creative discussion augmented with sketches ensued for about 10 minutes per case. Then, the researcher asked for feedback on previous ideas that had began arising in the first step of the ideation. In all, the conversation lasted about 2 hours.

This brainstorming conversation was a way to allow the researcher to expand upon the initial ideas and multiply creativity. Basically, this effort was geared towards generating more creative loops in the process. The researcher gained from exposing his ideas thus inducing a form of talk-back as described by Schön (1983). The designer friends offered a new take on the cases and sometimes criticized the initial vision. For example, the vision for ProBeauty was to focus on the personalization of the product content. A reusable packaging idea led the researcher to reconsider the problem and opportunities in the delivery side of the business model. The next step would be to unite these two ideas into a coherent concept.

The third step of the ideation phase, was to expand the ideas in more comprehensive concepts. This meant developping the ideas to form business model, service scenario and product design. Each case had some content in each category but not an overall perspective of the entire concept. The goal of this

step was to make sure the concept was well rounded in that the ideas for each level built on each other to have a coherent whole. This was also the time to make sure the business model patterns that were present in the ideas were still at the foundation of each concept.

Prototype

The main objective of prototyping is to generate content that can be used in the subsequent test phase to validate the ideas. During the prototyping stage, the initial concepts are transformed into a form that can be presented to an audience for testing. This requires taking the sketches and notes and reframing them into a final presentation format. The business models sticky notes were rewritten in electronic format. The service scenarios were redrawn and written up in a document. The product sketches were cut out and assembled on a single panel.

Therefore a prototype does not always have to be physical. Design thinking takes advantage of the benefits of making a prototype wether it includes a physical component or not. Non physical prototypes can be understood as a visual form of communication. For example, a design team can prepare a brochure, a poster or a website to describe a product's benefits in enough detail to test a potential client's reaction. That is the approach we choose to follow.

The prototyping phase required cleaning up and attempting to simplify the concepts into a final presentation. There remains a creative aspect when some ideas add-on to the concept to make it even more coherent. This is the main challenge of the prototyping stage to both reduce and augment the concepts to their most eloquent expression.

As we mentioned earlier, designing sustainable business models can benefit from including product designs and service scenarios to make the whole more coherent and understandable. In this phase, we made sure to prototype these three levels. So, each case had a 3 part prototype. It first consisted in a written description of the current business model, the co-creation concept and the design thinking concept. This design thinking concept was accompanied by a triple layered business model canvas filled out in colour. The second part was a service scenario of at least twelve (12) scenes. The third and final part was a product design concept which made explicit the current approach and a future vision for the product. We now go in further detail for each.

Because business models are intangible we used the canvas as a means to visualize the concept. During the prototyping phase, we completed the 27 components of the business model canvas with in mind the 3 patterns we had chosen for the case. Most of the vision and ideas had been exposed in the ideation phase. The prototyping phase ties loose ends to make sure that the components relate to each other. Some wording in the components was improved. Again, this phase is focused on making the business model coherent by linking all the individual ideas and components with one and other. For example, if we are to propose an environmental pattern of encouraging sufficiency for Mavericks, there can be a financial and social reinforcement. When using the bathroom unit, a consumption counter could indicate the use data not in terms of litres of water, but as a financial cost or in comparison to an average consumer. This aspect of the business model is more comprehensive with the help of a service scenario.

To physically prototype a service scenario is possible (Stickdorn and Schneider, 2012) with a mock-up

store or a test run with a limited amount of users. But, with the limited resources and time we had for each case, it was not feasible to do so. For the service scenario we created a narrative structure that links the business model components. It condenses the content in a story made of twelve scenes. Most important of all, this prototype tells the story from the point of view of the client. This change of perspective enables a different view on the business model and serves a form of validation to make sure the service scenario seems desirable for the client.

In a product design process, prototyping usually entitles making a physical product. In one of our 5 cases, we did attempt to make a physical product to represent the concept from the previous phase. However, this project became time consuming and was not at the core of our answering our research question about the design of sustainable business models. We decided to limit what had become a side project. In turn, we decided to present each product design concept as a small poster in 11inches by 17 inches format. Each poster had a column on the left side to share some information about the context. This column exposed a description of the current situation in a few points and then vision statement composed of a few strong guidelines for the future. The remainder of the poster, the right side, visually demonstrated the products concept. In our research, these were hand drawn sketches but they could have been computer generated renders of products.

Test

There were two steps to the testing phase of our business model concepts. First there was an informal presentation of the business model concept during the additional meeting with the participants at their offices. This presentation had for objective to reveal our business model concepts and make sure the

participants could ask questions if they had any. The researcher's business model concepts attempted to be futuristic and highly original. Of course some initial feedback was offered by the participants during this face to face meeting with the participants. However, the participants did not have time in this short presentation to take in the concepts and reflect upon the content. Their feedback was somewhat an emotional reaction of surprise and gratefulness.

Six months after the initial face to face presentation, a second and more encompassing step of the test was to gather feedback by email from the participants. That meant that the participants could reflect upon their answer and respond as critically as they felt necessary without having to manage an emotional barrier of a face to face conversation. A qualitative survey of 5 questions was sent for the participants to answer at their convenience. We wanted to learn about how they react to these concepts 6 months later. We also wanted to gage how far away these concepts seemed from today's reality. We purposely worded the questions negatively to receive constructive criticism. For example: “why could this vision of the future not work as planned?” Or “How could this proposed futuristic vision be more realistic?” In a design thinking exercise, we seek to learn and grow from the feedback.

The results of this test phase are the responses of the participants to our qualitative survey. Their answers relate to their appreciation of our more sustainable business model design concepts. That is why the participant feedback is presented in Table 11 in the design outcomes section that follows. However, some of the content of the participants' feedback does shed some light on the design process.

For example, the VP of Corporate Development at RainPipe provided constructive negative feedback. He

states: “To be honest, this is interesting, but far from reality. I see this exercise as being creative and entertaining but so far from our reality that is does not merit much follow-up. For a vision like this one to flourish there must be a strong commitment. However, I doubt I could get a member of our Board to commit to it”. Aside from the fact that our business model concept of a local energy provider did not persuade this manager, we learn that the manager sees this exercise as a finished product versus an ongoing process towards improvement and innovation.

The content of the design thinking process should be seen as a stepping stone into a subsequent cycle of refinement as was the case for ProBeauty. The R-D manager had a different take on the result of the process. “When we are out of our comfort zone, we often try to think of negatives points to new ideas. But the fact that we are confronted by these new ideas is giving us a way to look at the different possibilities.”

The design thinking process applied to business models is about not seeking a single best answer but a coherent avenue for progress. Therefore, no matter how close or far from reality the business model concepts are, the design process seeks to resonate with the participants and build momentum for innovation. This is an example of how the design process is part of a design approach that can guide the transformation of organizations towards more sustainable business models.

In conclusion, this section exposed the many facets of the design process we explored through multiple iterations. Our design process thus evolved through the experience of the co-creation workshops and the additional 5 phases of a design thinking process. In this section, we shared the experience of the

workshop as an intangible artifact. It is the workshops of our dual design process that served as a witness to this evolution. We now turn our attention to the artifacts created for the third part of a design approach: the outcomes.

4.3 Design outcomes artifacts

This action research has been rich in generating content towards arguing our thesis for a design approach to sustainable business models. We have seen previously the tools and process artifacts and we now turn our attention to the outcomes of the use of the design tools and a design process. There are 4 artifacts that demonstrate the design outcomes for this research: (1) the more sustainable business model concepts for each case, (2) the business model patterns used for the concepts, (3) an evaluation of the sustainability of the concepts, (4) the accompanying service scenarios and product design concepts, and lastly (5) participants feedback.

The first way to present the design outcomes are the business model concepts created for each of the 5 cases. Each case presents four distinct elements. First, we expose the basic profile of the organization. The participating organizations' names have been changed in order to preserve the participants' preference for corporate anonymity. Second, we shortly describe their current business model. Third, we share the main elements of the business model concept they co-created with their fellow participants. Fourth, we share the main elements of the business model concepts resulting from the design thinking process. We remind the reader that the participating organizations' names have been changed in order to preserve the participants' preference for corporate anonymity.

1. Rainpipe
   Main industry: Rainwater management
   Product: Rainwater pipes
   Number of employees: 170
   Date of establishment: 1978
   Innovation maturity: Intermediate
   Sustainability maturity: Beginner
   B2B

   Current business model
   Rainpipe's current business model is based on selling a variety of products that answer all storm water management needs such as collecting, conveying, treating and storage. They design, manufacture and distribute high quality products, primarily made in HDPE plastic resin. Considering themselves as leaders in the eastern Canada and north eastern US, they serve 5 major sectors from agricultural, natural resources, infrastructure, residential and commercial.

   Co-creation workshop
   The co-creation design business model concept for Rainpipe begins with the idea of helping cities finance the purchase of their higher quality product. They are in competition with low cost cement solutions and a financing plan could help extend the purchase on a longer period which goes hand in hand with the product's long lasting life of more than 100 years. This long life is also part of the environmental strategy as it would encourage efficiency. In the long term, the city would reduce the amount of materials and more importantly the amount of heavy maintenance work required to upkeep the water management system. From a social point of view, this concept would look to serve the needs of smaller cities who do not necessarily have the engineering expertise in-house. Rainpipe could create partnerships with local engineers to be part of the project as entrepreneurs.

   Design thinking concept
   The professional design thinking approach dreamed up a vision of a company that not only provides storm water solutions but one day generates electricity with micro-turbines within the storm water pipes. The company could create partnerships or expand its role from a manufacturer to a contractor capable of building street infrastructures. We propose for the municipal client to rent out the space beneath its streets so that utility companies would pay a fee for the access. In return, the utility companies would charge the city for the services it provides such as data, electric, gas or water management. Part of the environmental and social benefits are that citizens could have access and even become owners of a locally distributed form of renewable energy. In all, this concept of a more sustainable business model for Rainpipe revolves around the idea to both sell the energy it generates and the service of storm water management while playing a larger role in the construction and management of the infrastructure.

2. Offurniture

Main industry: Commercial furniture
Product: Worktable
Number of employees: 850
Date of establishment: 1983
Innovation maturity: Advanced
Sustainability maturity: Advanced
B2B

Current business model

Offurniture's current business model is based on selling a complete furniture solution to large organizations whom wish to personalize or customize their workspaces. Offurniture's large production capacity allows them to supply dealers for a distribution across North America. They roll out new products regularly, pay close attention to design details and aim for a price point under industry giants.

Co-creation workshop concept

The co-design for Offurniture added to the current manufacturing business model a new location service. This could attract smaller client organizations with 3 to 4 year leases. The materials could come form refurbished furniture which would reduce the material production volume while leveraging the existing employee resources. The transaction could take place over the internet and allow for the client to choose preset customization options. This alternative to the current marketplace could allow an outreach into developing countries for clients to get access to higher quality workstations.

Design thinking concept

In the design thinking process, the professional designers also based the business model concept on a leasing service through a transactional website. However, the business model focused on offering a B2C approach for the employees of the client organization. The business model concept makes it possible for the employer to create an individual budget for each of his employees. In turn, they each can select a furniture solution tailored to their individual needs and even the amount of refurbished or new products. This concept can offer similar environmental benefits from remanufacturing but it encourages sufficiency by building an emotional relationship when selecting a custom solution. The business model pushes for a behaviour change in employers who share the responsibility with their employees and greatly enhance their autonomy.

Example of Co-Creation Content Generated

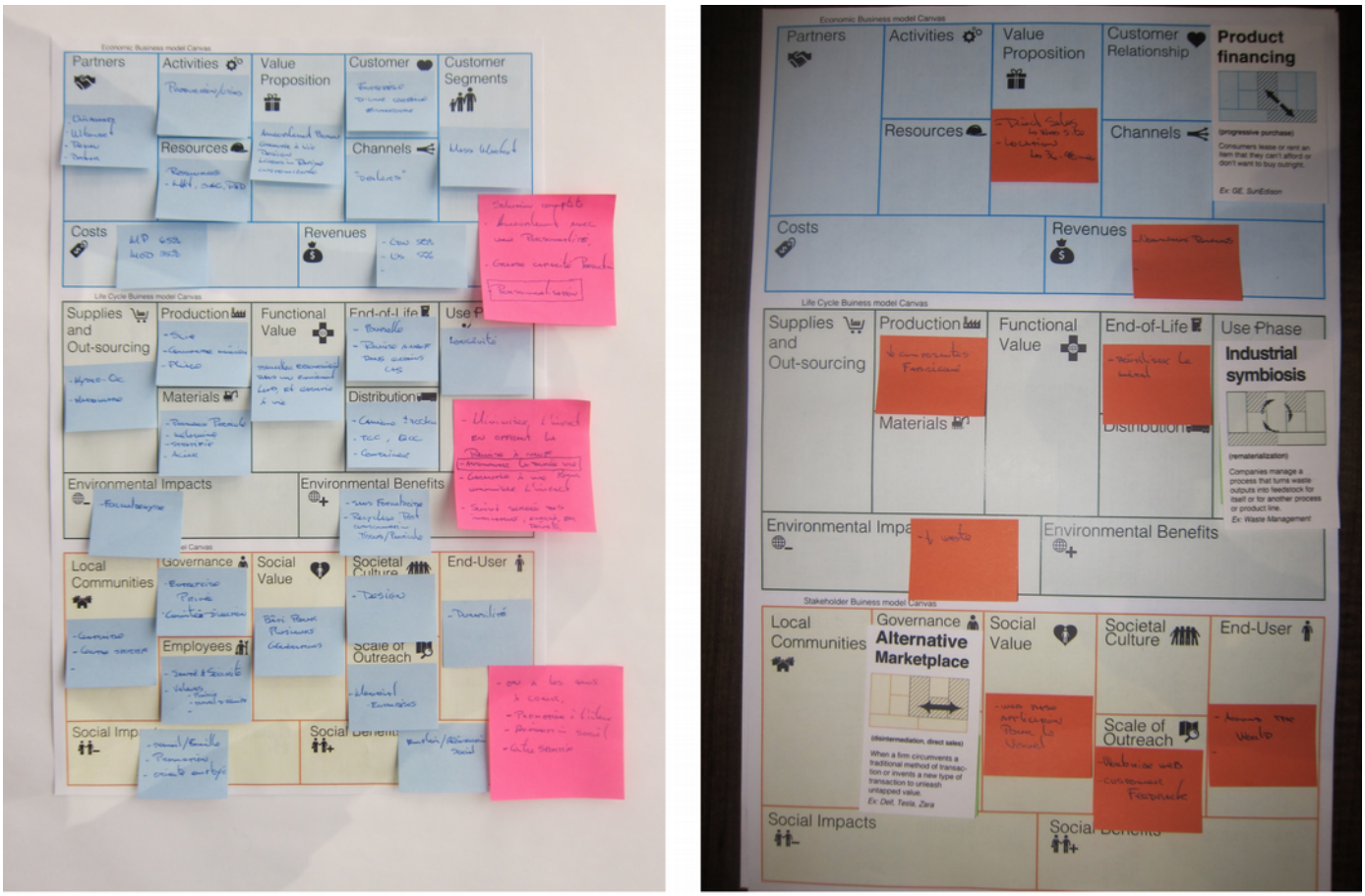

Figure 16. An Example of the Business Model Canvas data generated with Offurniture's present business model and co-creation concept.

Example of Design Thinking Content Generated

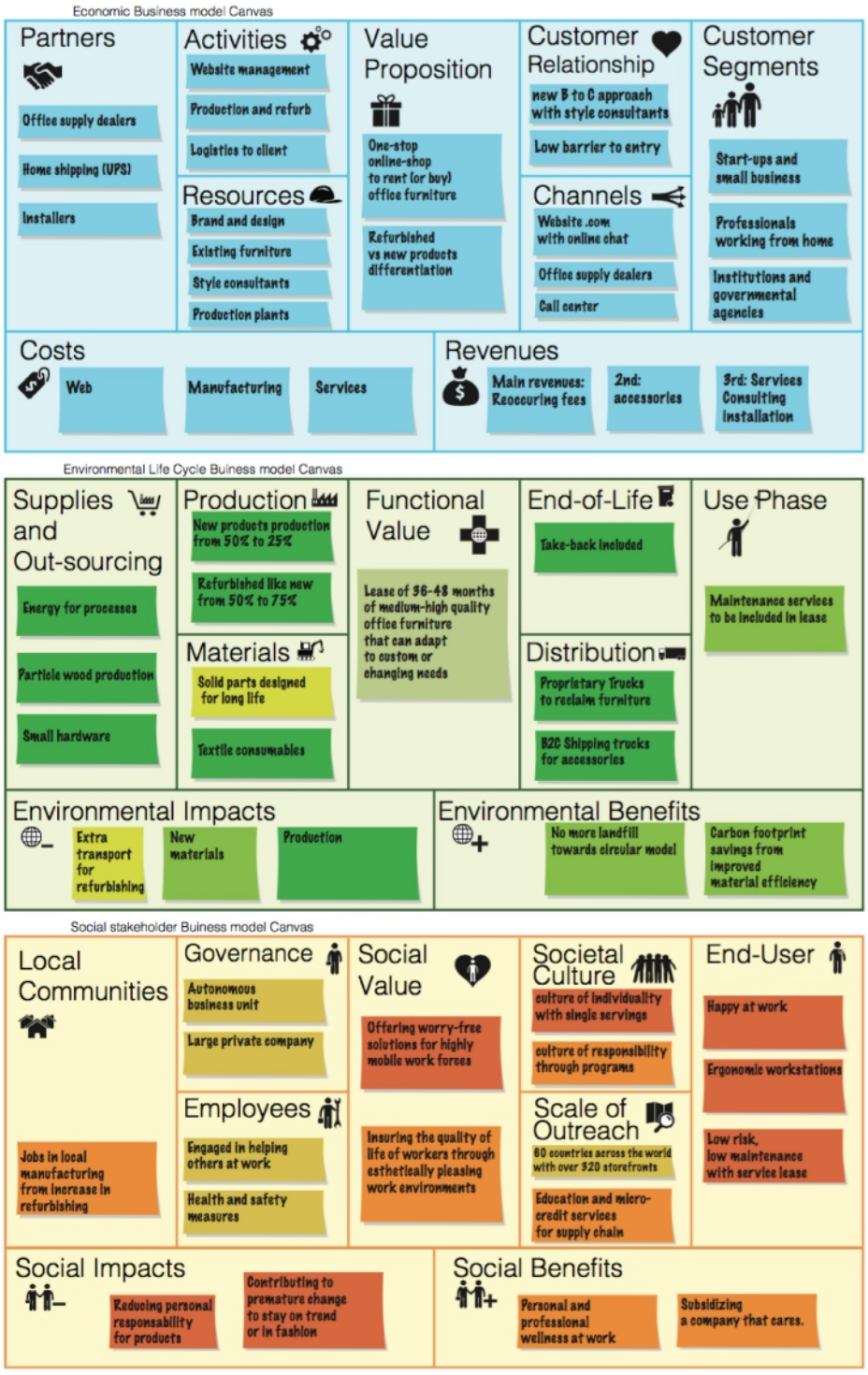

Figure 17. An Example of data generated with Offurniture's more sustainable business model concept from the design thinking process

3. PaperLam
   Main industry: Pulp and paper
   Product: Laminated Paper packaging
   Number of employees: 75
   Date of establishment: 1992
   Innovation maturity: Advanced
   Sustainability maturity: Leader
   B2B

   Current business model
   PaperLam's current business model is mostly based on selling laminated paper to package and protect large paper rolls during transport. Their main client base is the pulp and paper industry where demand for newspapers is declining. An alternative market they are also present in is the food packaging industry. PaperLam generates value by transforming materials from the other business units of PaperLam group such as recycled paper fibres or recycled cardboard into specialized and customized packaging solutions.

   Co-creation workshop concept
   The co-design gave birth to a business model concept where PaperLam earns a part of the savings they are able to generate in partnership with the client. This idea begins with PaperLam seeking to understand its client's activities in order to better design and even operate new technologies at the client location. Inversely, this concept moves the business model away from the client buying and owning paper volume towards monetizing the functional service provided by PaperLam. Also from an environmental perspective, the new packaging processes will be built to create financial savings by optimizing time and materials. By including the client in the improvement process, they become part of the solution.

   Design thinking concept
   The external design team's business model concept starts with the idea that packaging material could provide more value functioning as a data point more than as a protective device. The fibres would be “smart” in the sense that they can be identified and tracked with a simple app. The business model proposes a hidden revenue model coming from its clients in the food industry paying for access to logistical databases about where and how their products are being shipped, used, recycled. To improve the rate of recycling, each kilo of fibres would be given a financial value depending on the age of the fibre materials. This co-creates a new marketplace that incentivize people to recycle more and faster. This take back program could even become an alternative full time living wage for unemployed or low income earners.

4. ProBeauty
   Main industry: Beauty products
   Product: Make up and skin cream
   Number of employees: 175
   Date of establishment: 1949
   Innovation maturity: Intermediate
   Sustainability maturity: beginner
   B2C

   Current business model
   Currently, ProBeauty's business model is based on selling beauty products and creams at a lower price than industry giants. They market the added value of all their products being hypoallergenic. Their manufacturing processes involve little automation and function in batches. They are agile in answering local trends and fashions. They have also segmented their client base by creating a sister brand aimed at a younger female public.

   Co-creation workshop concept
   The co-design process arrived at a business model that centres on a mobile application that takes a picture or even a video of the customer and then proposes a rendering of 3 to 5 make-up styles in real time. In the app, there is the possibility to order all the beauty products required for a certain result. The revenues come from monthly subscription and a feeling of paying for success. The packaging products for this line would come from renewable sources and would be biodegradable. A marketing campaign would build a partnership with a cancer patient centre and give away the subscription to women patients who have gone through chemo therapy. This would allow the cancer survivors to go back to feeling good about themselves.

   Design thinking concept
   The design thinking process arrived at a concept for ProBeauty that also works in a subscription model. The product formula would be split into three components: a base cream, ingredient “A” and ingredient “B”. The customer first receives an explorers kit to test out different proportions. Once satisfied with the right formula, the customer sends the details to ProBeauty who produces batches every 3 months for the time of the subscription. The packaging is to be sent back to the company to be filled up again thus reducing the need for new materials. So this model thrives from mass customization while co-creating directly with the customer. From a social perspective, the business model allows for disintermediation by creating a stronger relationship between the customer and the provider.

5. Maverick
   Main industry: Construction
   Product: Bath and showers
   Number of employees: 265
   Date of establishment: 2004
   Innovation maturity: Advanced
   Sustainability maturity: Beginner
   B2C and B2B

   Current business model
   Maverick is currently running a business model that sells a differentiation of exclusive bathtubs to multiple clients at a time. They distribute certain products through outlets such as big box stores and specialty retailers. But they also contract multiple units for commercial and institutional clients. The company is a large employer in their home town playing an important role in that community.

   Co-creation workshop concept
   The business model concept of the co-creation workshop came up with the idea of providing a design expertise for the customer. By customizing the product to the specifications of the customer, the company could cater to the experience the user seeks. When installing a new bathtub, the company takes back the old bathtub. This has positive repercussions on the community and employees.

   Design thinking concept
   The design thinking team's idea for the bath business model is to create a complete solution by creating partnerships with other manufacturers in the region. By offering a standard solution(razors) to housing complexes, the consumption behaviours (blades) of each owner or tenant can be compared to the building average. As the complete bathroom solution generates smaller revenues to increase adoption, it is the revenues from energy and water consumption that plays a central role in the business model thus encouraging sufficiency.

We wondered what could more sustainable business models look like for small and medium sized manufacturers? It was by combining multiple business model patterns that we can address the economic, environmental and social aspects. We used the triple layered business model canvas and business model patterns cards to generate more sustainable concepts as 5 cases presented in the previous artifact description chapter. Our artifacts showed great variety in the concepts and we now

interpret them to confirm our initial hypothesis and arrive at new findings.

Since the tools and the artifacts' format for both design processes were very similar, we can directly compare the underlying business model patterns that were used to generate a more sustainable concept. In the following table, we list for each case three business model patterns. The first pattern of the three refers to the economic, the second to the environmental and third to the social aspect of the business model.

Business model patterns used in concepts

	Co-creation process	**Design thinking process**
Rainpipe	Product Financing, Encourage Sufficiency, Social entrepreneurship	Pay for success, Substitution for renewables, Social entrepreneurship
Offurniture	Product financing, Industrial Symbiosis, Alternative Marketplace	Produce on demand, Encouraging sufficiency, Behaviour change
PaperLam	Pay for success, Functionality not ownership, Inclusive sourcing	Hidden revenue, Circularity, Co-creating a marketplace
ProBeauty	Subscription, Substitution for renewables, Social entrepreneurship	Subscription, Circularity, Alternative Marketplace
Maverick	Provide on demand, Substitute with renewables, Inclusive sourcing	Razors and blades, Encouraging sufficiency, Co-creating a marketplace

Table 8. Comparison of business model patterns used during co-creation and design thinking processes

When analyzing this table we see that there is very little overlapping in the patterns used for each design process. This can be explained by the fact that design thinking process was stimulated to propose

original business models building upon the co-creation outcomes. Nevertheless, this table serves to demonstrate the heterogeneity in the choice of business model patterns in the pursuit of more sustainable business models. That is to say that it is not the choice of a specific pattern that generates more sustainability. On the contrary, the sustainable ideals, driving the foresight design approach, made use of the business model patterns to arrive at that end. The varied use of business model patterns illustrated in this table demonstrate our hypothesis that a co-creation process enhances the subsequent design thinking process when it comes to conceptualizing a vision for a more sustainable business model.

After having created multiple design outcomes we seek to validate that our outcomes yield sustainable business models. We presented in the introduction how Stubbs and Cocklin's (2008) arrived at 6 principles that what make for a sustainable business model. In the following table, we refer to each principles to evaluate if our concepts match their criteria. We must advise that the original definition was not intended as a normative tool, however it is the best means we have found to validate a business model as working towards sustainability.

Evaluation of design outcomes with the 6 principles of sustainable business models (SBM) by Stubbs and Cocklin's (2008)						
	A SBM draws on economic, environmental and social aspects of sustainability in defining an organization's purpose	**A SBM uses a Triple Bottom Line approach in measuring performance**	**A SBM considers the needs of all stakeholders rather than giving priority to shareholders' expectations.**	**A SBM treats nature as a stakeholder and promotes environmental stewardship**	**Sustainability leaders, or champions, drive the cultural and structural changes necessary to implement sustainability**	**An SBM encompasses the systems perspective as well as the firm-level perspective**
Rainpipe	The purpose of the organization is to reproduce hydrological systems before urbanization by managing rain water for the next 50 years	Services rendered, Carbon footprint savings, Material efficiency, local economic development.	Offering jobs to locals and disabled people.	The end goal of water management is to avoid floods in urban areas.	The in-house engineers build relationship with the city workers to change the current model.	By moving from the sale of a product to enabling energy production while managing rainwater.
Offurniture	The purpose of the organization is to offer ownership-free refurbished work environments for highly mobile workforces.	Performance is measured in revenues from reoccurring fees, that avoids landfill through material efficiency, and a positive workplace atmosphere built on individual choice.	Offering a choice to end-user employees to cater to their specific needs	Reducing the overall carbon footprint with improved material efficiency in a circular model	The website structures a new relationship between the company and the client, however, there is little mention of who will drive this change internally.	By shifting the responsibility of choosing furniture from employer to employee and client SMEs can better manage organizational changes.
PaperLam	The purpose of the organization shifts to providing access to a database of product logistics and consumption rates	Performance comes from financially encouraging quicker material reuse cycles thanks to a modular take-back program	Improving the awareness of the supply-chain and potentially providing additional income for unemployed	Packaging fibre materials recycled and recyclable while improving the transported product's lifetime	B2B accounts representatives engage clients in a real-time website and application	Helping clients improve material use and logistics with feedback on consumption flows.
ProBeauty	Organization thrives from allowing customers to personalize their formulation with a longer term membership	Performance is measured in terms of material efficiency and carbon savings but more importantly in answering customers personal needs with customizable products	Because every skin is different, this model allows for the client to create her own formula.	Testing formulations could create initial waste but seeks to optimize material efficiency in the end with a refill program	A beauty agent plays a role in educating groups of consumers towards a better formulation for their skin type	The end goal of this model is to ensure a better relationship between the products and the user's needs in a longer term perspective.

Evaluation of design outcomes with the 6 principles of sustainable business models (SBM) by Stubbs and Cocklin's (2008) - continued -						
	A SBM draws on economic, environmental and social aspects of sustainability in defining an organization's purpose	**A SBM uses a Triple Bottom Line approach in measuring performance**	**A SBM considers the needs of all stakeholders rather than giving priority to shareholders' expectations.**	**A SBM treats nature as a stakeholder and promotes environmental stewardship**	**Sustainability leaders, or champions, drive the cultural and structural changes necessary to implement sustainability**	**An SBM encompasses the systems perspective as well as the firm-level perspective**
Mavericks	The purpose of the organization grows to providing an autonomous water management solution for a bath/laundry room	Performance is measured in reduced consumption of water and energy as well as market adaptation	Stakeholders are now shareholders as the organization takes on the form of a coop investing profits to further improve global efficiency.	First of all, the system would allow for net zero water consumption as well as energy efficiency through synergies	End-users are stimulated with feedback levels and financial incites to improve their consumption rates	By working with local manufacturing partners, the organization changes the scope of the system to a more encompassing solution

Table 9. Evaluation of design outcomes with the 6 principles of sustainable business models (SBM) by Stubbs and Cocklin's (2008)

To the business model concepts we presented earlier, we now share the accompanying service scenarios and the product design concepts. They represent another form of design outcomes of our action research. Each case presents five distinct elements. First, we expose the basic profile of the organization with quantitative data from external sources such as the number of employees and general qualitative markers from the researcher's perspective such as sustainability maturity. Second, we shortly describe their current business model. Third, we share the main elements of the business model concepts resulting from the foresight design projects. Fourth, we synthesize the service scenario that conveys the business model from the perspective of the client. Fifth, we characterize the potential innovation avenues from new product designs.

The concepts of more sustainable business models, services, and products for 5 manufacturing organizations					
	Foresight inputs		**Design outcomes**		
	Current business profile	**Current business model**	**Business model concept**	**Service scenario**	**Product concept**
Rainpipe 1978 170 empl. B2B	Rainpipe is an innovative but smaller player in the Rainwater management industry selling plastic pipes. Their sustainability practices are underdevelopment	Answering public work tenders with a variety of products that answer all storm water management needs such as collecting, conveying, treating and storing.	Selling energy produced locally within rain water management contracts.	The service is built with the city client in a face to face service provider experience.	Taking advantage of floods to generate energy from water flow with micro-turbines integrated in pipes
Offurniture 1983 850 empl. B2B	Offurniture sells commercial furniture. The local division acts like an independent SME with advanced innovation and sustainability practices.	Selling a complete furniture solution to large organizations across North America whom wish to personalize or customize their workspaces.	Providing the end-user employee a choice of office furniture products leased in a service contract with employer.	Web-based customer experience allows for personal selection.	Custom options needs such as active use, technology management, or mobility within the spaces.
PaperLam 1992 75 empl. B2B	Paperlam laminates paper into packaging to serve the papermill industry. They are sustainability leaders and advanced in innovation practices.	Selling specialty packaging solutions to protect large paper rolls during transport. They are diversifying towards food industry applications.	Providing access to a logistics database for customers to track consumption history through packaging	Real-time application for data management and business to business contact.	Packaging products made of smart fibers that embody data in material composition
ProBeauty 1949 175 empl. B2C	Probeauty is a small player in the make up and skin care industry. Their innovation maturity is intermediate and their sustainability practices are novice.	Selling beauty products and creams at a lower price than industry giants. They market the added value of all their products being hypoallergenic.	Product customization and membership for long term relationship	Personal Beauty advisor creates a human experience outside of a retail environment or online user experience ships product directly to home.	Create your own product formulation with exploration kit.
Mavericks 2004 265 empl. B2C and B2B	Mavericks created a division to manufacture bath and showers. They are advanced in innovation, but novice in sustainability.	Selling bathtubs with exclusive differentiations to multiple clients such as big box stores and specialty retailers as well as commercial and institutional contracts.	Towards net zero water consumption and optimal energy efficiency in leasing a complete system built with partners.	Product offers feedback of consumption efficiency to improve human experience.	Bath product now part of a larger system for all washing needs outside of kitchen.

Table 10. The concepts of more sustainable business models, services, and products for 5 manufacturing organizations.

Example of a Service Scenario

Service Scenario *Rainpipe*

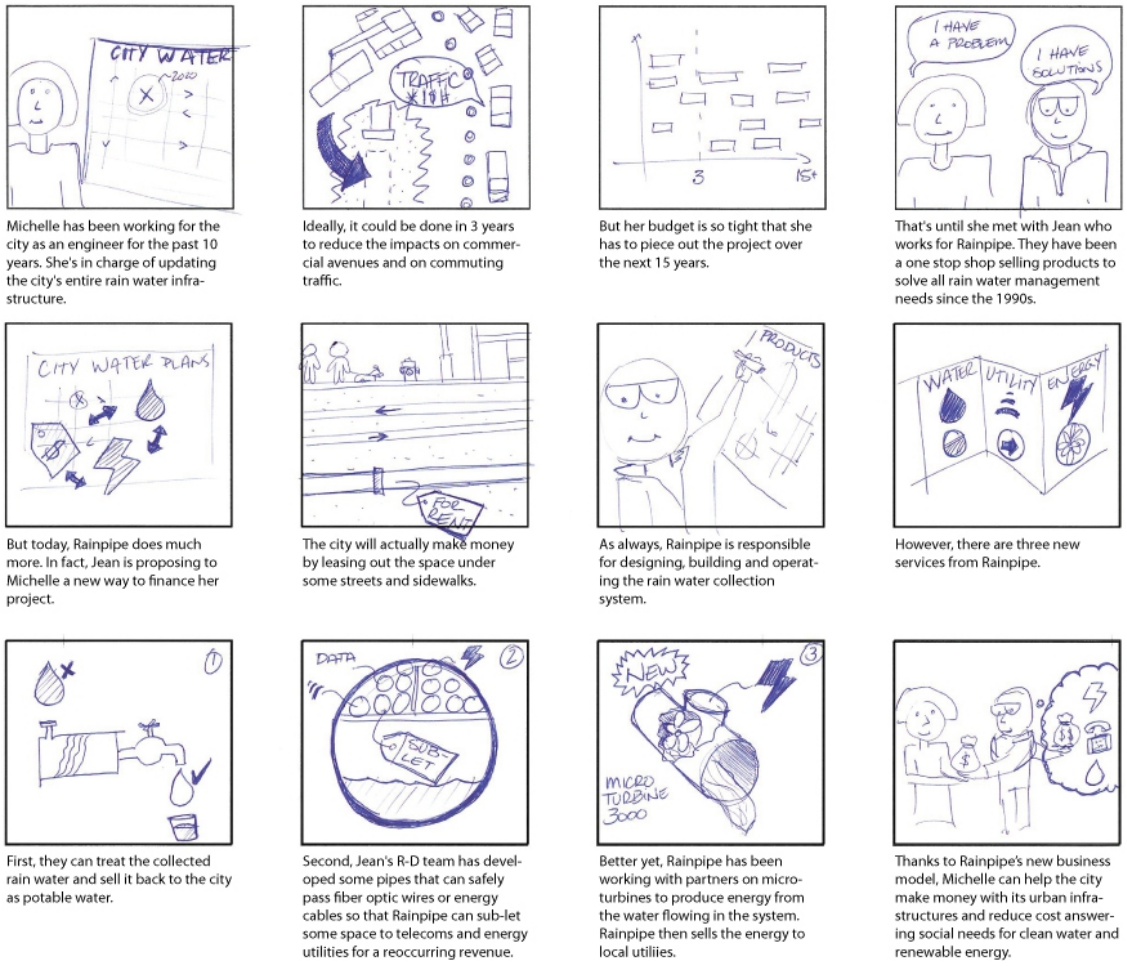

Figure 18. Example of Rainpipe's service scenario

Example of a Product Design Concept

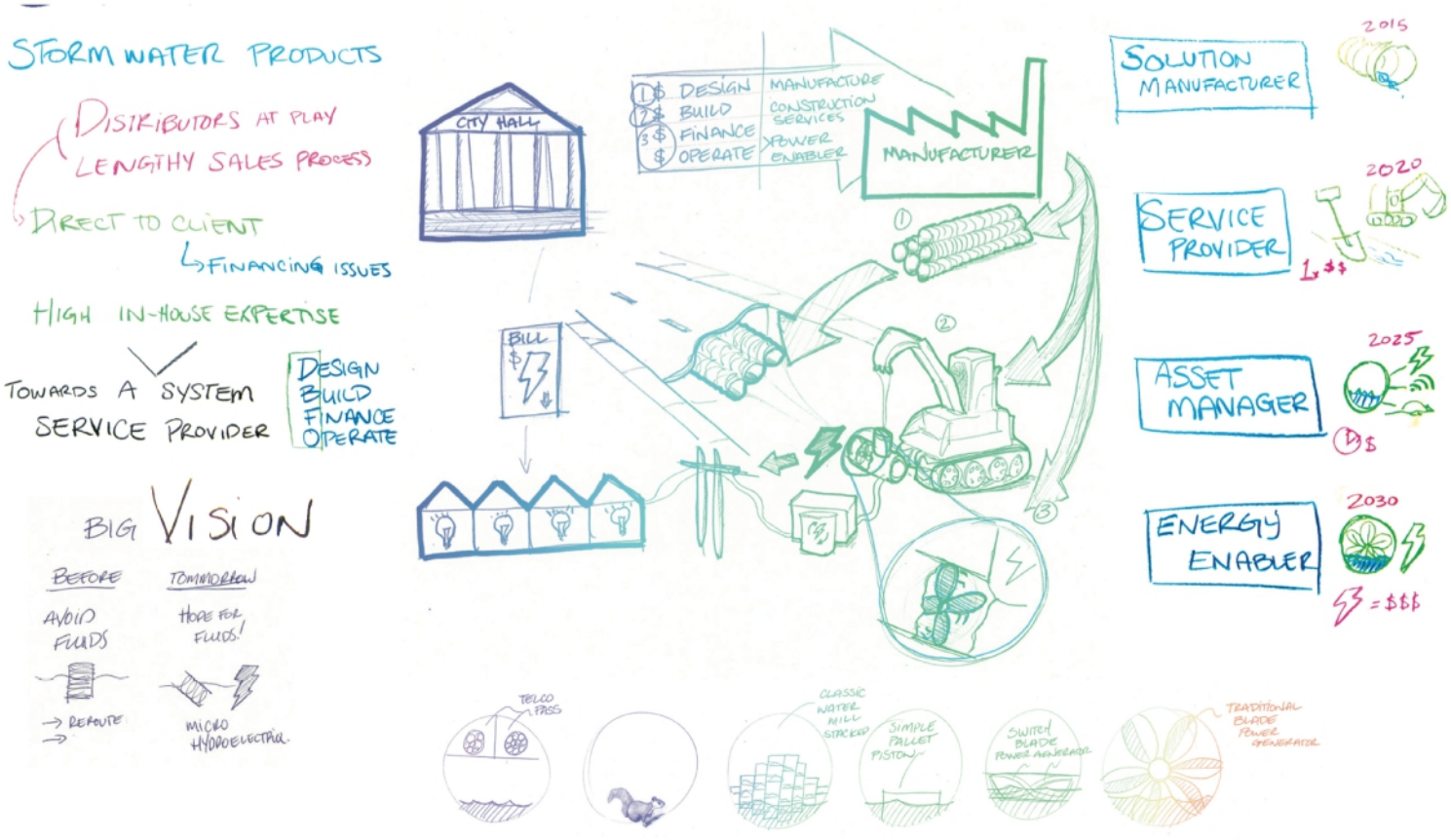

Figure 19. Example of Rainpipe's product design concept

So far in this research, we have established design outcomes as the concepts (or artifacts) that were created within our design process using our design tools. However, we can also point towards the shift in the mindset of the participants as another form of outcome. We returned to our participants at least 6 months after having presented with business model concepts, service scenarios and product designs. We asked them 5 probing questions to asses the value of our design outcomes and our design approach in general. We expose their answers in the following table.

Participant feedback

	1) In general, how do you react to this futuristic business model concept?	2) How do these ideas change your perception of your business's potential?	3) a) When could this business model be implemented? 2015? 2020? 2025? 2030? 2040? +?	b) Which aspect makes it innovative or futuristic?
Rainpipe VP corporate development	I'm more pragmatic with 30 years of experience in the manufacturing sector, so I often tend to analyze these new approaches with a critical view related to my experience. A lot of technologies would have to be developed, outside of our main expertise field in order to realize this fantasy. As well, the model or concept requires us to go from a Manufacturer to a financial entrepreneur, where I see multiple problems in this transition phase.	Our potential can be, in my opinion, more easily exploited by modifying less the current business model of a manufacturer than by trying to transform ourselves in an entrepreneur and energy supplier.Simply by increasing our market share in the concrete industry we could double our presence, and this, while always mastering our first expertise as a manufacturer.	The first two phases could be realized in 10 years, for the two other phases, 15 to 25 years at best (the technology development is time consuming).	What makes it futuristic is to base parts of our revenues (energy production) on a technology that doesn't exist yet or on weather forecasts that could have a great impact. Let's image a very dry summer, with 20 days without any rain, no water in the pipes would mean no electricity production therefore no revenues. That's a major risk for us.
Rain pipe Marketing director	When we look at the "Futuristic Business Model", concretely, it doesn't appear to be realistic, but it forces us to get outside our world's view when we imagine the future. It helps to break down our barrier and allows us to dream.	The potential of our business changes by establishing business partners that allows us to come out of our geographical or strategic zone. A small step have already being taken but I feel that the vision of our business is now being influenced by this process.	I'm not involved in the creating of the business model in our company, I'm not too sure what to answer this question.	
Offurniture Director of R&D and supply chain	Very well, many elements can be integrated completely or in part to our organization. Thinking outside the box is natural for us. The proposed model is on trend at the social, technological and ecological levels.	Our current business model must be challenged.	It could be functional at 100% in 2020.	To work directly with the "end user" via web technologies.
PaperLam Production manager	I'm really interested in the future of our plant. Really good ideas came were generated during this activity. The five sheets provided by the researcher are posted on my wall and I sometimes look at it to see if we are aligned with the ideas.	We convinced senior management to put more effort in the service offer to our clients. Since then, we have an engineer working 100% of its time on the services offered.	We see it more at 2020.	Really, the idea to go directly to one of our customer's factories and do its packaging on site is an interesting way of doing business that we are willing to investigate in the future.
ProBeauty Manager R-D	It is a great way to create custom content and to answer very specific needs of our customers. It's funny, we to a little bit of this with another brand for the preparation of a Personalized Gloss and we call it MyLab. I didn't this concept to be futuristic enough though, there are already some companies that create custom creams from your ADN, right on the internet. On the flip side, I find the idea of having a specialist (during a women's night) to be a good idea to help determine the specific needs and products the client would need.	I don't understand the question.	With the technology development, we should not wait for too long before this project is put in effect. It would take a huge internal reorganization concerning the production management, inventory and expedition, not an easy task in a short time frame! We are currently experiencing it with Annabelle and since this concept is a marketing tool of the brand, the costs generated to manage this project are quite high.	Meeting with an expert makes this idea look like an innovation in our field. We view customization as the trend of the future, however this might not become a standard, and if it does, it will be for a very specific market.

Table 11. Feedback collected from participants concerning our design approach.

Participant feedback (continued)

	4) a) Why could this vision not work as planned?	b) How could this proposed futuristic vision be made for realistic?	5) a) How relevant to your company is the creation of a futuristic vision of your business model?	b) How could it be even more relevant to your company?
Rainpipe VP corporate development	Our manufactured pipes are all the gravity type, which do not sustain pressure in general, aside when it rains and there is very little water. The low pressure turbines (if they were running) would only work at best for a few days per month and in the summer mostly. On top of it, the idea to go from Manufacturer to Entrepreneur is difficult to implement. We would become a competitor to our clients, so this is difficult to execute without doing multiple acquisition.		To be honest, this is interesting, but far from reality. I see this exercise as being creative and entertaining but so far from our reality that is does not merit much follow-up. For a vision like this one to flourish there must be a strong commitment. However, I doubt I could get a member of our CA to commit to it	It would be more useful to transform the current business model by taking small steps. This would help to identify achievable goals by using technologies that do not put the company at risk. We cannot forget that our business is an employer that allows many families to thrive and the generation of value to help these families must go on without interruption.
Rain pipe Marketing director	This vision would not work because innovation in the infrastructure world is limited by the norms in place set by government. This field is seriously behind and the innovation must ideally serve to help the practical side.		This model was useful to allow reflection on our situation. We also happen to have in parallel a business process with an external consulting firm. These two exercise allowed to update our outlook. With limited means, we will try to go ahead in our market, to have a long term vision more in sync with the future generations needs.	
Offurniture Director of R&D and supply chain	Often the users online are looking for fast delivery and a competitive price. We have to offer our clients a standard line of product that can be delivered quickly. We have to avoid custom designs that requires longer assembly time and higher costs.	We would in my opinion have to change the "brand" behind the business model since our business is associated with a specific product distribution. A new brand would avoid the confusion.	This is useful because it allows our minds to understand the future options for our organization. We already have in our business plan elements to put in place that happen to be very similar to the model presented.	It would be interesting to identify the SWOT in this exercise in order to demonstrate the company's strengths and also identify the weaknesses or gaps to fill.
PaperLam Production manager	Our clients, whom many have unionized factories, must convince the unions of the good value of this new idea.		I think this exercise allowed us to open our eyes to the importance of looking at the future. We are too often stuck in the day to day operations and we do not take the time to look further ahead and this is toxic for a company.	I think that having more resource to work on these ideas would really help.
ProBeauty Manager R-D	What makes me hesitate with this concept is that the custom side could become very expensive, while we are known to have very affordable products. We cannot go above 40$ for a skin care product. As well, the fact that we would re-use the same packaging would bring the cost higher. In order to reuse the packing, we have to wash it, disinfect it and ensure it's not contaminated. By developing a process of cleaning and sterilizing at low cost, we can't promise that our clients will receive their initial packaging.	In order to reuse the packing, we have to wash and disinfect it and ensure it's not contaminated. While developing this cleaning process at low cost, we cannot grantee that the client will receive its original packaging.	This allows us to get out of our comfort zone and to think further. While we are out of this zone, we often always try to think of negatives points to new ideas. But that fact that we are confronted by these new ideas is giving us a way to look at the different possibilities	I think that by having the people responsible of other departments concerned (web, production, marketing, R&D, packaging design and AQ/CQ) doing this exercise, we could definitively better adapt the futuristic scenarios to our reality.

Table 11. Feedback collected from participants concerning our design approach.

In this artifacts description and evaluation chapter, we have laid out all the content we generated and collected during our workshops. We exposed the foundation of our triple layered business model tool, the accompanying business model pattern cards. To speak for the design process shared the artifacts generated in the 5 cases. Those artifacts were the business model concepts we co-created and then the concepts that emerged from the design thinking process. We validated them to make sure they responded to the 6 principles of sustainable business models. Then we exposed the artifacts of our design thinking exercise with the inputs and the different levels of outcomes. The last data we collected was the participant feedback on the design approach. All these artifacts now lead us into the discussion to extract findings from this content.

Chapter 5. Discussion

In the previous chapter, we presented the content we created and the data we gathered data in following our action research protocol. The main thesis of this research is that a design approach to sustainable business models can be constituted of three elements: tools, process and outcomes. In this chapter, we raise three topics of discussion to justify the relevancy of our design approach. First, we share our findings in light of our artifacts with respect to the three different elements of a design approach. Second, we discuss the lessons we learned and the insights we arrive at when building each element into a whole. In doing so, we strengthen our thesis by exposing how our research demonstrates that all three elements relate to each other towards a more complete design approach to sustainable business models. Third, we share the contributions each element brings to research. Fourth we share some of the limits of the findings in our study.

5.1 Findings from each elements of our design approach

Two design tools were developed in the course of this research. The first is the Triple Layered Business model Canvas and the second is the business model pattern cards. We now report on the findings from using each design tool in our empirical research.

5.1.1 Design tools findings

Design tool #1: Triple Layered Business Model Canvas (TLBMC). It was developed and refined through professional consulting, expert group workshops, and university teaching. This design tool provides a novel and integrative approach for understanding existing business models and supports creatively

exploring sustainability-oriented business models innovation. Having intentionally developed two layers by extending Osterwalder & Pigneur's popular business model canvas, the TLBMC allows for users to explicitly integrate thinking on environmental and social impacts into their business model. Also, the new layers of the canvas provide space for balancing a triple bottom line approach. While indicators of environmental and social impact are not yet as standardized and universal as for financial impact, this lack of standardization allows for flexibility in what organization may choose to emphasize through their actions. The comments of the R&D director of a large manufacturer mirror much of our feedback, stating:

> *"In a single day workshop, we were able to use the triple layered canvas to discover unexpected opportunities for innovation in areas of our business we hadn't explored. This new vision brought by these tools is extremely useful today in a context where everything is accelerating and where businesses must continually adapt and innovate."*

From such feedback we gather that the TLBMC provides both additional space for users to explore various aspects of value creation, and more importantly it allows for a coherent approach for creative thinking across the business model. In particular, the TLBMC provides users with strong horizontal and vertical coherence in their thinking (see Figure 20).

Each layer allows some level of depth in making explicit different types of value creation, which we refer to as horizontal coherence. Horizontal coherence comes from the use of each layer, which provides an integrated way for users to explore an organizations actions and relationships in regards to how it creates economic, environmental, and social impacts within each layer.

Understanding each layers' dynamics and relationships may also facilitate broader systems thinking proposing a more holistic view of the entire business model. In our ProBeauty case, the new business model was built on two main vectors. First, they would sell a container, made by partners, that increases the value of what was once considered a single use packaging. Second, they offer the cream as a personalized consumable. At the economic level, this model thrives because it locks customers into a "razors and blades" business model with the recurring sales of consumables. At the environmental level, this model distributes the impact between the container and its consumables but ProBeauty can include the impacts of the production of the containers. At the social level, ProBeauty actively supports material suppliers and could speak out about the social impact of its product for its users. This simple analysis of the two main vectors demonstrates how to reign in the opportunities with current environmental and social inefficiencies of the razors and blades economic model. From the use of our design tool, we have begun exploring broader issues which go beyond the organization itself and included discussions such as how to collaborate with stakeholders to develop more environmentally and socially beneficial models to generate new economic benefits.

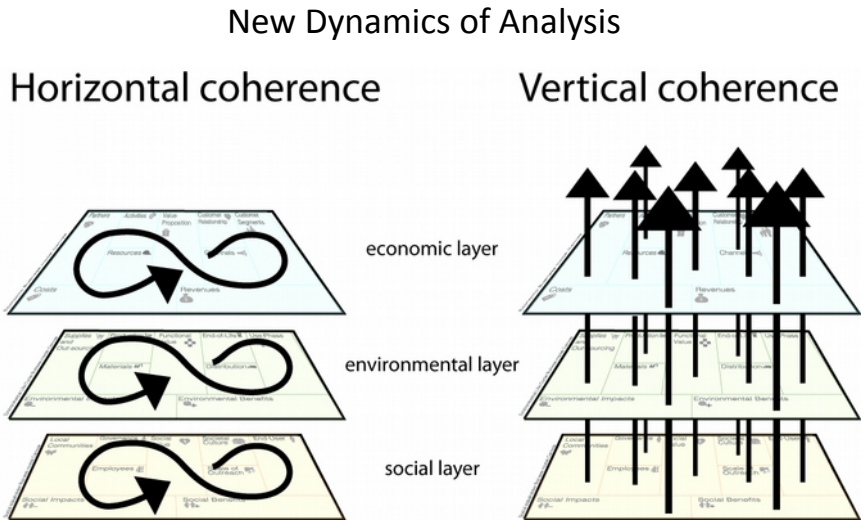

Figure 20. New dynamics in the Triple layered Business Model Canvas

Second the alignment of each organizational components between each layer, provides a vertical coherence. Vertical coherences comes from the connecting of the components of each layer to their analogs in another so as to better elucidate the connections between actions in one layer (e.g., stakeholder engagement) impact value in another (e.g., meeting future resource requirements). By integrating economic, environmental, and social perspectives into a multi-layered canvas, the TLBMC provides a more holistic understanding of an organization's actions and relationships which can support in a more systems-level perspective on developing sustainability oriented innovation within the firm and across its broader context (Zott and Amit, 2009).

Vertical coherence also supports exploring the alignment of actions and interconnections across the different types of value proposes a linear view of each business model component. With Offurniture, for example, one may see a lack of alignment across the canvas layers in terms of the connection between its customer relationship, end-of-life actions, and societal culture. The initial customer relationship stemmed from a long-term relationship perspective founded on a business to business approach to now leasing Offurniture products over an internet based service in a business to consumer fashion. This digitalization support in the customer relationship can also transpire in the end-of-life with an active database management of product take-backs and a remanufacturing program to reduce its environmental impact. From the societal culture, in the past, a one size fits all solution was negotiated in advance between the sales representative and the corporate client. The shift towards an online service in the client relationship means the leasing service becomes a means to enable an individual selection within a product catalogue as well as a shared community experience for group spaces. While selling online is a relatively minor innovation, it does point to how environmental and social concerns through the TLBMC can lead to a more active and creative exploration of sustainability-oriented innovations

among organizations.

From our research artifacts and participant feedback, we can testify that the TLBMC provides a **structure** for its users. First, it can serve as a *representation* of a business model ensuring all key elements are taken into account and understood holistically. As such, it has also supported collaboration around designing new business models, such as in the initial research phases of a creative process to determine the current state of the organization. Second, the triple layered business model canvas can serve as a *generative* tool, whereby users can explore the impacts of changing individual elements of a business model and the cascading consequences of such change throughout the layers. Again, the visual aspect of the TLBMC facilitates understanding and describing a business model as it focuses on the interconnections of key elements. Third, it can serve as a *validation* tool. One can use the TLBMC to begin balancing the costs versus benefits of business model concepts from economic, environmental and social perspectives. A second form of validation can come from previously mentioned vertical and horizontal coherence. In all, this represents a new structure for creating and analyzing sustainable business models.

Design tool #2: Business model pattern cards. The set of 24 business model pattern cards proved to be very useful in two cases. First, our professional participants wanted to recognize the existing patterns that were current exploited by their organization's business model. Once the participants could acknowledge that they applied the mechanisms of one, two or three patterns, then they tried to see if a new pattern could offer a novel interpretation of how the business could work. If this new pattern seemed coherent in their view, then they could begin building upon this emerging idea by going deeper into the elements of the canvas that were visually emphasized on the card.

No matter if looking to represent the present or to imagine a future business model, we noticed that most participants used the cards in the following manner. They would lay out all the 8 cards of a certain colour on the table to have a holistic perspective of that layer. Then they would hold up and look at each card one at a time. They discarded the patterns that did not show interest. They kept the few interesting cards close by. They compared the selected cards and finalized their choice down to one or two cards. Then, they moved to another layer of the canvas and repeated this selection process. They ended up with at least 3 or more cards that describe their business model concept in terms of economic, environmental and social layers. They would conclude by making sure there was coherence within the three patterns and the different layers. This is an example of what we have just described as vertical coherence. In case some patterns did not seem to make sense together for their business situation, they would go back to a set of cards to adjust the choice in favour of their strategy. From the participants use of the business model cards, we find that any combination of cards can be relevant. However, it is the participant's interpretation that allows for building a rationale in insuring the coherence in the economic, environmental and social layers.

Combining the canvas with the business model pattern cards, these tools accelerated the generation of new ideas for more sustainable business models during our workshops. In all, by integrating economic, environmental, and social perspectives into a multi-layered canvas with pattern examples, our design tools ended up structuring a more holistic understanding and a system's perspective for the participants with respect to their organization’s actions and relationships.

5.1.2 Design Process Findings

The second element to what constitutes a design approach is concerned with the process of the design . We undertook a co-creation process in addition to a design thinking process within a general foresight workshop. When analyzing the artifacts in each of our research cases, we find four advantages to combining both types of design processes. From these advantages, we have witnessed how a dual process leads to a stronger vision of organizational sustainability.

The first advantage we found when proceeding with a co-creation process before undergoing a design thinking was better understanding the problem from the client's perspective. Earlier in the theoretical framework, we spoke of Schön's reflective practice (1983) and how knowledge arises within the design process as the designer gets “talk-back” from the design activity. We lived from first hand experience how co-creation greatly improves the pertinence of the subsequent design thinking process. In this case, the co-creation serves as an initial design iteration from which we can generate a “talk-back”. Stepping back, we see that the co-creation process generates a first design iteration which creates a virtuous circle that reenforcing itself. First the co-creation ensures a better understanding of the organization but also engages the participants and vice versa, as once again “*participant engagement is critical to ensuring relevance*” (Lüscher and Lewis, 2008). For example in the Rainpipe case, both concepts started from the struggle of the client municipalities to finance higher quality. The co-creation concept remains within the current economical context where as the design thinking creates a new context to eliminate the initial struggle. Consequently, the environmental and social approach changed from reducing impacts to generating benefits. In both concepts the level of environmental and social benefits reflected the level of change that the business model concept involves. The initial co-creation situated the project and created a first iteration as a starting point for the following design thinking process. Moreover, we find that the

co-creation process allowed for tacit information to be discovered on the nature of the context and the ambitions of the organization as the participants created their visions of the future. This was useful in fine tuning the additional design thinking approach towards a more pertinent and more complete concept.

Secondly, the co-creation process allows for the participants to become familiarized with the design tools and the outcomes of the design process. Their participation also provides them with a first hand experience of the size of the challenge that is imagining sustainable business models. For example in the ProBeauty case, the concept of personalizing the product is present in both the co-creation and the design thinking outcomes. The co-creation team proposed to make a mobile application and later attempted to address the social value by adding a marketing campaign. The design thinking process led to a “Do-it-yourself” where the clients directly enjoy the social benefits of adapting the products to their own needs. Having gone through a design process themselves, ProBeauty was able to better appreciate the designer's concept that addressed the social dimension within the subscription business model.

Third, we have found another advantage by adding a design thinking process when seeking to create sustainable business model concepts. It stems from the process of design thinking which is less concerned with ending up with the best solution and more concerned with iteration and gathering feedback for learning. This ties back to the IDEO mantra “*fail often to succeed sooner*” (Kelley and Littman, 2001 p.232) we presented when discerning the remaining differences between a design and management approach to problem solving. When it comes to the PaperLam case, this notion of a learning curve was also foundational in the design thinking process. The designers leapfrogged over the struggle to sell more material in a declining market and demonstrated the learning potential and the

new value of offering access to data. In terms of the product concept, we did not offer a single solution but six different avenues to explore towards using cardboard fibres as data enablers. We gather from this example and its root in past theory that a design thinking process frames the different outcomes as a means for learning and not as an end result in and of itself.

Fourth, we have found that the design thinking process can move further into building future visions by defining ideals as guidelines. In two cases, Offurniture and Paperlam, the co-creation team voiced concerns with protecting manufacturing jobs as well as maintaining the current business model alive. As mentioned by the Paperlam RD director he needs to : “convince the unions of the benefits of this new reality”. In contrast, the design thinking process was more concerned with better answering the client's needs and even proposed ideals. In the Offurniture case, the business model concept envisioned boosting the client's employees autonomy. In the Maverick case, the goal was to reduce energy and water consumption through feedback. We can interpret these last two advantages of an additional external design thinking as a demonstration that organizations are focused on concretely solving short term problems where as a foresight design approach uses outcomes as way to build towards ideals as a guideline.

To conclude on the process findings, we reiterate the four advantages to our dual process of co-creation and design thinking: relevance from engagement, experience from process, learning from iteration and ideals as guidelines. On one hand, the co-creation process resulted with ideas that were quicker to implement. On the other hand, the design thinking process built on the co-creation process to generate far reaching ideas for the future. So, we would have to change the saying to “if you want to change fast, envision together; if you want to imagine far into the future, design from ideals.”

5.1.3 Design outcome findings

There are two avenues we explore to extract findings from our use of design outcomes. The first is to find out the role that design outcomes can play in a design approach towards sustainable business models. The second is to gage the influence of design outcomes related to current management thinking on the organization.

To ground in theory our understanding of what design outcomes can provide in our chapter on the conceptual framework, we identified the three characteristics of sketches according to Purcell and Gero (1998). Building on this analogy with sketches, we argued by induction that our design outcomes can influence the design of more sustainable business models in three similar ways: as a working memory for learning, as imagery for reinterpretation for multiple futures and as mental synthesis for serving an ideal. We now expand on each characteristic individually with examples from our fieldwork.

One of the roles of design outcomes is to become a foundation to gather feedback and thus guide further development. By using our design outcomes as a working memory, we are foreshadowing the capacity of the organization to learn and mature. For example, when we propose for Rainpipe to move from a product manufacturer to a service provider to an asset manager to an energy provider in just 15 years, we are breaking down the progressive steps towards an audacious goal. This reminds us of backcasting where a future vision is translated into strategies and actions aimed at bridging the present with the future states (Dreborg, 1996). Moreover, the working memory characteristic of design outcomes serves as a vehicle to support a discussion about an idealized future. It creates a reference that can be used to evaluate how far away these ideas are from the current organizational positioning

and mindset. The Vice-President of Rainpipe stated it best : “ The concept of a solution provider to service provider is very realistic, the asset manager is farther from reality and that of an energy provider is, in my opinion, a utopia.” Moreover, he stated that the latter two steps are more like 15 and 25 years away. This reaction does convey a sense of the influence on an organization's mindset that accompanies foresight design.

The second characteristic of design outcomes we find in our foresight visions allow for imagery reinterpretation. By acknowledging that some problems can not be readily solved and offering multiple solution avenues, the design outcomes build an open view of potential futures. Again, we can cite a the product example in Paperlam's case where we suggest that there are 6 potential ways for the fibers of cardboard to contain data (air capture, carbon dating, layers, weaving patterns, ink and Ultra-violet signatures). The Probeauty service scenario details two different experiences, alone at home or with friends and an advisor, with different customer relationships and channels. We believe that such open-ended outcomes can be used as a stimulus or a trigger for a next generation. According to Sarkar and Chakrabarti (2008) these triggers can enhance the creativity of designers by significantly influencing the number and quality of the resulting representations and contents. Design outcomes that are open-ended, can be reinterpreted and thus generate more iterations. Although iteration is essential in a design process, Ballard (2000) distinguishes positive from negative iteration as the one that creates value. We contend that the design concepts we created in the form of business models, services and products are a form of positive iteration because they do not push for a single solution and provide multiple avenues for reinterpretation and further refinement.

When Martin (2009) wrote of a designer's cognitive ability of integrative thinking, he was imploring

business leaders to synthesize new ideas from two initially opposable concepts. One can demonstrate mental synthesis by understanding and representing the larger system and the relationships that occur. In terms of design outcomes, our concepts synthesize potentially opposite views or ideas. Perhaps the most compelling evidence of this comes from the Offurniture's service scenario that relates the potentially conflicting needs of an employer who is focused on managing assets and growth, a programmer that seeks to work either alone or with others during certain project phases and finally a manager who seeks comfort while needing her office furniture to be mobile because her space is used for events. The benefit of the design outcome is that it holds all of these threads into a coherent story that can be easily shared and understood while at the same time demonstrating an avenue where everyones needs are addressed.

Through these examples from our empirical fieldwork, we have argued how design outcomes can be interpreted as a working memory, reinforcing imagery and mental synthesis. That was our first finding for design outcomes. The second finding on design outcomes we will now raise is how they relate to management thinking on organizations.

First, we will look at our design outcomes concepts as a whole and second we will see them as three different levels with business models, services and products. As a whole concept, the foresight design outcomes we created in this research provide what Collins and Porras called an “envisioned future” (1996). This envisioned future is a strategic tool composed of both a 10 to 30 year audacious goal and a vivid description of what it would be like to achieve this goal. We have seen that our design concepts formulate multiple types of ideals which can become benchmarks of attaining future goals. We see our sustainable business model concepts becoming a directing force for the organization by focusing

attention and "*grabbing people in the gut*" (Collins and Porras, 1996). It is important to state that whether our design outcomes are followed in detail to exact completion is not the proper measure of success for foresight design. Like a concept car, our design outcomes have for objective to open minds, focus attention and inspire change. To testify to this mental shift, we captured feedback from participants. Consider Offurniture's R&D director who told us: "*Our current distribution model needs to be challenged.*" And, PaperLam's production manager affirmed: "*I am really interested by the future of our plant. Good ideas have come from this activity. The [design concepts] you made are on my wall in my office and sometimes I look at them to see if we are working towards those ideas*". With these accounts, we can affirm that our design approach to sustainable business models, as a whole, works towards changing perceptions and serves as an ideal when working towards the future of the organization. They also testify to the importance of adding the notion of a design outcome on top of tools and process to describe a design approach.

Second, we endeavored to generate three levels of design outcomes: business models, services and products. Theses three outcomes come from Buchanan's orders of design (1998) and from the historical steps in the evolution where management and design converge. Now respond to how we can relate each outcome with organizational levels. We can retrace the idea of hierarchy in Anthony's pyramid (1965) when elaborating a structural framework for management control. He depicted strategic planning happening at the highest level of management, tactical or managerial decisions in the middle and frequent operational decisions at the bottom. The same approach was then reproduced by Gorry and Morten (1971) for information systems with the addition that the information for decisions go from structured to unstructured at all three levels. Inversely, Redman (1998) researched how poor data quality influences all three levels of management. To show how pervasive the strategic, tactical and operational

framework has become we can point the field of logistics where the works of Schmidt and Wilhelm (2000) who have thoroughly reviewed past literature to discuss quantitative modelling issues or Gunasekaran et al. (2004) who have used the frameworks to measure the performance of suppliers. These three levels of strategic, tactical and operational are similar to that of Sinek's (2009) popular marketing approach called the “golden circle”. He discusses how organizations should begin their communications with the purpose or the 'why' in order to engage with their audience emotionally. Then comes the 'how' which speaks to the means and actions to be taken. Lastly, the 'what' addresses the basic characteristics or the functional results. We remind the reader that an outcome is not simply the result of a design activity but the qualitative characteristics such as the subsequent interpretation and the insights. By using these three questions, we refocus the purpose of the design outcomes away from the physical results to the qualitative interpretations that enable.

Levels of Design Outcomes for Organizational decisions

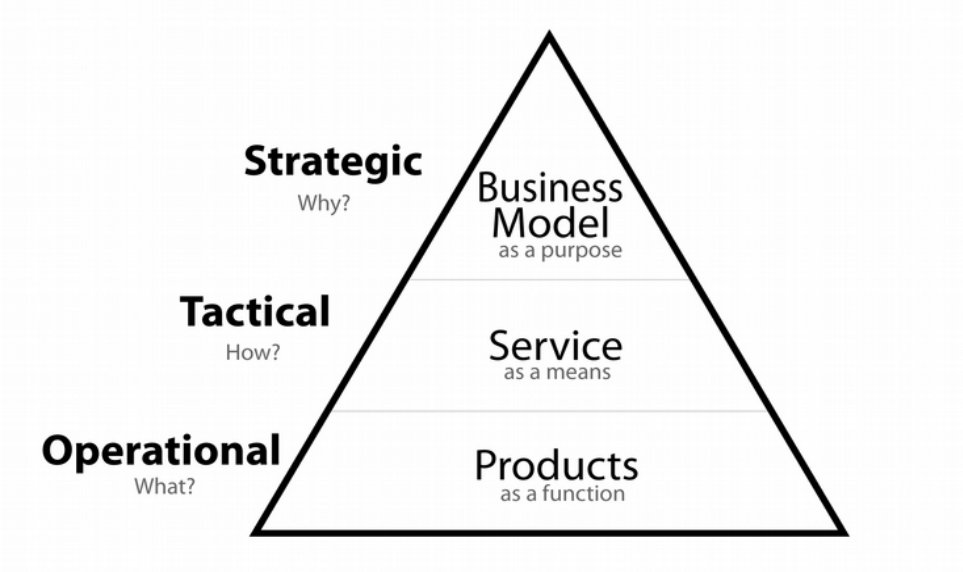

Figure 21. By aligning the different levels of the organization to the three levels of design outcomes, we arrive at a three leveled pyramid.

By aligning the different levels of the organization to the three levels of design outcomes, we arrive at a three leveled pyramid. This diagram represents our understanding of the role that the different design outcomes can play when designing more sustainable business models. We claim that all fives cases align our three levels of design outcomes with the three levels of management decisions. For example, the business model of Rainpipe describes the purpose of the business as reproducing the hydrological environment before urbanization which sets a strategic vision of the future. Next, Rainpipe's service scenario is more attuned to describing the tactics by which the organization will interact with city engineers to fulfill this vision. Finally, the Rainpipe product concept that generates energy while managing rain water lays out future operations from new functions. We can provide another example of alignment using Offurniture's case and Sinek's 'why', 'how', 'what' model. The business model outcomes

identifies a radical shift in strategy from selling products to large companies who are smaller in number to leasing out to an ever growing market of small businesses. The online service scenario changes the tactics of how Offurniture interacts with its customers. And at the functional 'what' level, the furniture changes the approach to ergonomics from seeking comfort in static positions to accommodate new products that enable active work.

To sum up, this diagram seeks to show how the three levels of design outcomes we have created are aligned with the types of questions that arise when designing more sustainable business models. We see strategy supported by the business model to answering 'why' questions related to the purpose of the organization. The tactical addresses the means of how an organization offers its service. And finally, the product responds to the 'what' by operationalizing a function for the client. By aligning the different levels of outcomes and questions, we foresee this pyramid helping managers and designers understand their role when envisioning an organization's future.

We now conclude on our findings within design outcomes. When it comes to designing more sustainable business models, we first demonstrated the three benefits in our design outcomes which we have determined as expressing, similar to sketching: working memory, imagery reinterpretation and mental synthesis. Moreover, we find that there are multiple levels of outcomes that reinforce strategic business models such as tactical services and functional products. Together, these levels of design outcomes can help envision an organization's future in terms of sustainability.

We arrive at the conclusion that to undertake a sustainability journey, organizations can envision a destination at many levels of thinking thanks to varied design outcomes. Instead of “its the journey not

the destination", we propose a new saying: "Part of the sustainability journey is designing a destination". Now that we have exposed the findings for each of element of design approach, the next section will review the arguments for each proposition in relationship to each other and discuss how they come together to create a coherent design approach.

5.2 Findings from our design approach as a whole

We start by revisiting the main points we raised when we exposed our key findings. We then expand upon why all three elements - tools, process and outcomes - are needed to create a sense of a whole in a design approach to more sustainable business models.

Proposition #1 :

A design approach makes use of **tools** to envision business models for sustainability.

Tools + ~~Process~~ + ~~Outcomes~~ = Missing experience

Learning point: Tools do not come with know how (or "*The map is not the territory").*

Insight: Tools structure knowledge.

In comparison to traditional design tools such as sketching, scenarios or mood boards, we proposed a new tool as a hybrid between a creative design tool and an analytical management tool. The two design tools we shaped and tested are a triple layered business model canvas and the business model pattern cards. Both were developed to arrive at more sustainable organizations. There are other canvas like tools

that can be utilized to further determine the influence of tools on the design of sustainable business models. Some simpler (Short et al., 2013) others more complex (Upward and Jones, 2015).

From our experience in facilitating workshops with our triple layered business model canvas and the business model pattern cards, we now recognize the strengths and weaknesses of our design tools. We have found that these design tools helps users to quickly visualize and communicate existing business models, explicit missing data or information gaps and creatively innovate new potential business models which are more explicitly oriented towards sustainability. By developing environmental and social canvas layers which extend directly from the structure and components of Osterwalder & Pigneur's (2010) original economic-focus canvas, these two new canvas layers provide a horizontal coherence which connect each component within a value layer together; and the canvases together provide a vertical coherence across the canvas layers which provide a more holistic perspective on creating broad value through the business model. Moreover, the business model patterns cards allowed for participants to understand and represent the interconnections and relationships between an organizations' current strategy and actions and its economic, environmental and social impacts. Thus, we can conclude that our design tools provided users seeking creative sustainability-oriented innovations with greater structure into understanding an organization in its relationships with the broader business, environmental, and societal or community contexts in which it is embedded. However, the participants did not have an understanding of how to use the tools to initiate change. When provided only with the tools, some student participants lacked the experience to undertake an iterative process of transformation.

We finished this part of our research by acknowledging that the tool by itself can not lead to sustainable business model concepts. The tool does structure the different parts of a more sustainable business

model, but it does not insure the means of generating concepts nor does it attest to the quality of the content provided. Tools alone can not provide enough knowledge, such as know how from experience, to tackle complex issues such as sustainable business models. Simply put, there needs to be a guiding process.

Proposition #2:

A design approach enables an intentional **process** towards business models for sustainability.

Tools + Process + ~~Outcomes~~ = Missing direction

Learning point: Process needs direction (if not "*All roads lead to Rome")*

Insight: Process builds on experience

The second element of our design approach showcased two complementary design processes that used the same design tools to arrive at more sustainable business models. The first process was a co-creation workshop that **engaged stakeholders** from manufacturing companies. The second process was a design thinking workshop with the researcher acting as an external designer. On one hand, we learned that the professional participants were focused on solving their **problem situation**, which was done by understanding it from a system's view of the business model. On the other hand, the co-creation process was lacking a sense of direction. In our research, the direction we are striving for is a more sustainable

business model. We recognized how difficult it was for the participants to significantly and simultaneously improve the economic, environmental and social aspects of their business models when attempting to solve shorter term challenges. This is why we added a complementary design thinking process which was more concerned with developing visions that strive for ideals that in turn can serve as a learning tool. More importantly, we noticed that the foresight process for imagining sustainable business models with external designers led to more **further projecting** ideas because it benefitted from the previous co-creation process with the professionals in organization. Our artifacts showed a variety of business model patterns that were used in both processes, and we concluded that a co-creation process and a design thinking process, together, offer greater opportunities for **learning** and progress.

We have witnessed how our dual design process can lead to more sustainable business model concepts. However, the process is highly influenced by the participants and by the quality of the content that is provided. That is to say, that even with the most well adapted tools, and the most creative processes, there still needs to be a sense of direction given to the design effort to arrive at more sustainable business models.

This notion of direction is broad as it can be an ideal, a measure of success or a destination. A direction such as more sustainable business models is implied but not imposed in the structure of the triple layered business model canvas tool. Nonetheless, but that was not enough for our co-creation exercise to arrive at far reaching concepts of sustainability. As we will see in the next proposition, it was by building on multiple design outcomes that the design thinking process was most productive at generating a vision of a more sustainable business model.

Proposition #3:

A design approach builds upon multiple **outcomes** towards a business model for sustainability.

Tools + Process + Outcomes = A design approach

Learning point: Vision is not implementation (or "Dreams don't work unless you do.")

Insight: Outcomes return direction.

To explore our third proposition we built upon the same design thinking process but went further by studying three different and complimentary outcomes. We already had validated that the outcomes could be interpreted as concepts of more sustainable business models as per the 6 principles outlined by Stubbs and Cocklin (2008). Then we wanted to show three different levels of outcomes: business models, services and products. We also questioned how these three outcomes addressed three different levels of organizational thinking: strategic, tactical and operational. We found three characteristics that our design outcomes serve within a design approach. First, they allow for a **working memory** which serves as a foundation for further iterations and development. Second, outcomes enable **imagery reinterpretation** by acknowledging that some problems can not be readily solved and thus questioning the viewer multiple solution avenues for multiple possible futures. Third, design outcomes play a role as a **mental synthesis** in that they take into account the larger system and the relationships that occur by integrating potentially opposing ideas into a single coherent concept. From our artifacts we confirmed that design outcomes create a reference that can be used to evaluate how far these ideas are from the current organizational positioning and mindset.

For the third element of our design approach, we focused on the outcomes, as designed artifacts, that resulted from our process while using our tool. Our design outcomes took on three forms: business models concepts, services scenarios and products designs. Because they were more sustainable and far reaching, they can serve as a vision to guide an organization into the future. However, a vision is not the implementation. Our concepts are simply a coherent representation of a potential future, not the realization in the present. This will be further discussed in our limits.

Synthesis of Research Findings and Insight

Elements of a design approach	Existing Construct	Types	Findings	Insight
1. Tools	Business model canvas Pattern cards	Economic Environmental Social	Generation Representation Validation — Vertical coherence Horizontal coherence	Tools structure knowledge
2. Process	Foresight & advancded design methods	Co-creation Design thinking	Stakeholder engagement Problem situation Further projecting Learning	Process builds on experience
3. Outcomes	Visions and sketches	Business model concepts Service Scenarios Products Design	Working memory Imagery reinterpretation Mental synthesis	Outcomes return direction

Table 12. By putting all three elements of a design approach to envision more sustainable business models together, we learned that tools structure knowledge, process builds on experience and outcomes return direction.

To conclude on defending our three propositions, we can assert with confidence that the three elements of a design approach -tools, process and outcomes- are essential to envision more sustainable business models. However, we are not declaring that this is the only possible type of tools, process and outcomes. Other design teams could modify or create their own tools, they could use a different mix design methods in their process and they could arrive at different outcomes like physical prototypes and service blueprints. However, **we do report from our empirical fieldwork that by putting all three elements**

together of a design approach to envision more sustainable business models we learned that tools structure knowledge, process builds on experience and outcomes return direction. This should be considered as our main finding.

5.3 Contributions

With this research, we hope to contribute to the field of sustainable business models and design research by undertaking an action research to empirically demonstrate the use of a design approach to more sustainable business models. We do so by establishing a new practice based on foresight design that can guide organizations with tools, process, and outcomes in the creative phase of their business model transformations. We endeavour to continue the evolution of design's influence towards Buchanan's 4th order of organizational design which happens to coincides with Nidumolu et al.'s 4th level of business models for sustainability and Brezet's 4th level of sustainability with system innovation. As mentioned earlier, the gap we are addressing in the field of sustainable business models lies in the means. To explore what a design approach could be, we proposed three elements that together from a whole.

First, the design tools we developed contribute to supporting creative sustainability-oriented innovations in the following ways. Our presentation of the Triple Layered Business Model Canvas contributes to research on sustainable business models (Boons and Lüdeke-Freund, 2013). In addition to serving as a tool for representation, generation and validation of business models, we demonstrated how the Triple Layered Business Model Canvas can help acknowledge new dynamics with both vertical and horizontal systems coherence. The triple layered business model canvas we created provide a robust structure and enables a meaningful discussion of multiple types of value creation. As opposed to attempting to fit it all

into a single layered canvas, our tool allows deeper understanding of economic, environmental and social relationships at stake. This, in turn, supports richer synthesis and more creative exploration of sustainability innovation through connecting each layer together. One can explore how an action on one layer of the canvas can ripple through other layers. Also, the TLBMC provides a concise framework to visualize and support communication and collaboration around sustainable business model innovation. At its core, we propose the TLBMC as a tool to further support the transition from incremental and isolated innovations to more integrated and holistic sustainability-oriented innovations which can better meet our ongoing global crises, energy and material constraints (Adams et al., 2015; Shrivastava & Paquin, 2011; von Weizsacker, 2009).

A contribution from our design process comes from how we added a design thinking process to a co-creation processes to take advantage of their respective strengths. Another contribution to the field of design research comes from how we undertook a co-creation and then a design thinking process. By that we mean that our co-creation process provided a) a good understanding of the current context, b) empowered stakeholder engagement and resulted with ideas c) potential business model innovation ideas that would be quicker to implement. Following in the path laid out by researchers in participatory design, this study should be considered as another example of a means for designers to perceive tacit needs by allowing for their stakeholders to express their ideas within a co-creation process. As the users create freely and intuitively while expressing their needs, solutions and ideas, the designers can have a third person point of view on the artifacts created. Therefore, we see designers assuring the creative process is right while interacting with participants taking on the role of a facilitator of conversation. After that, we witnessed the value from the additional insight that is derived from designers building on the content generated in the co-creation process. We demonstrated the value of an additional design

process where design thinking allows for the designer to propose visions of the future that were far reaching sustainability concepts, and thus creating new ideals that can guide the organization. This reflects the views put forward by Papanek (1972) as he acknowledged that designers have not to design for money but to design for many.

We also focused on outcomes as the third element of a design approach. We generated three levels of design outcomes in business models, services and products. Our first contribution is that we arrived at a practical way to insure that our design concepts can be interpreted as sustainable business models because they respond to each of the six principles of sustainable business models outlined by Stubbs and Cocklin (2008). Moreover, we share a novel interpretation of how design outcomes embody the same three characteristics that are present in sketches: working memory, imagery reinterpretation and mental synthesis. Finally, we contribute to management research by proposing a simple framework that aligns business models, services and products to their respective management levels in a pyramid that can guide organizations towards adopting sustainability.

In general, our outcomes also serve as an example of Buchanan's 4th order of design when dealing with organizations. For the field of sustainable business models, the artifacts designed for each of the five cases can be considered as an example of a sustainable vision for organizations as we hope to inspire other manufacturers in taking a similar direction. Moreover, these five cases demonstrate how to design and communicate a more sustainable business model. Finally, they also exhibit the usefulness of our design tools and their capacity to support a design process with multiple design outcomes.

5.4 Transferability of our design approach

The object of study in this research is sustainable business models. This influences the nature of the content we created and the type data we collected. We oriented our research protocol to arrive at specific outcomes of more sustainable business models concepts. After having demonstrated the value of combining all three elements in a cohesive design approach to the specific case of sustainable business models, we wonder if we could generalize this approach for the design of business models without regards to sustainability. At this point, we want step back from our research efforts and question the transferability of our work (Krefting, 1991; Shenton, 2004). In other words, do these three elements of a design approach apply only to the specific case of business models for sustainability?

Before addressing the transferability of our design approach to non sustainability related cases, we argue that designing business models to be sustainable, versus strictly for profit, is a more complex task. This is because our design approach to sustainable business models: 1) includes more variables into the system, 2) requires a more inclusive process and 3) implies a direction. First, our triple layered business model canvas tool has three layers -economic, environmental and social- and 27 components compared to the original 9 components on a single layer. Second, our design process included multiple stakeholders in a co-creation workshop and then an additional design thinking workshop. Third, the design outcomes embedded a direction to strive for far reaching sustainable ideals. In short, designing sustainable business models multiplies the number of relationships and types of value to work towards.

To answer the question of transferability, we can not claim that our design approach can fit conventional business model innovation based on the specificity of our research protocol and the empirical evidence we gathered. This is because we chose to focus on an initial problem setting that includes sustainability

at the strategic business model level. Basically, it is not because we addressed a more complex problem with our approach that a potentially less complex problem can (or should) be addressed with the same approach. Then again, we hope this research leads someone else to imagine a way to use design tools, processes and outcomes to create their own approach fit for the problem they seek to address. As Buchanan (1992) puts it: "*Design continues to expand its meanings and connections, reviewing unexpected dimensions in practice as well as understanding.*" (p.5) . Now that we have established that our approach is specific to designing sustainable business models, we direct our attention to the limits of our research.

5.5 Limits of our design approach for more sustainable business models

When speaking of the limits of natural inquiry such as in action research, Guba (1981) proposes to clearly define the problem boundaries to determine what to include and exclude from consideration. Following our dual design process with the use of our tools, the artifacts that show for the design outcomes have been foresight concepts of more sustainable business models. There are a few limits when it comes to interpreting these artifacts.

First we are discussing intangible ideas and concepts to explore the potential of sustainable business models. Our design approach is only devoted to the creative phase of a larger transformation process. This raises a question on the value of business model concepts versus their actual implementation. As mentioned earlier when referencing Johnson (2010), the journey of business model transformation starts with exploration, then acceleration and finishes with implementation. Because our initial objective was to focus on the first step of exploration, where there is a place for creativity, we can not insure that

our approach delivers viable concepts that will grow and mature into successful business models. Then again, that is not the objective of the exploration phase. The nature of foresight exercises means projecting multiple futures that are 10-30 years away (Vecchiato and Roveda, 2010). When it comes to implementing a novel business model over a period of several years, a longitudinal approach would have to follow an organization's management practices over time. Our research is thus limited to this initial exploration phase and we are not able to speak for the actual market response. The exact implementation of today's concepts is not to be measured for commercial success. Foresight exercises serves primarily as a strategic learning opportunity (Major et al., 2001). That is why **we see our design approach as the means to initiate change in organizations by providing a positive vision of what a sustainable business model can be**.

Our design process was enriched by multiple processes such as co-creation and design thinking. Our design process did allow for an ongoing loop linking thinking and making as well as inspiration and expiration as described by Findeli (2001). This allowed for our design process to move in successive steps from awareness, to critique, to reflection and then creation. When it comes to our research protocol, we did not undertake for multiple back and forth amongst the two design processes. We could have launched a second iteration loop by organizing an additional co-creation to build on the outcomes of the design thinking process. As Jones (1970) mentions creativity works best when progressing in multiple back and forth motions between the problem and solutions spaces. This would have further promoted the idea that the design process is not a systematic step-by-step sequence of pre-determined activities.

Another limit of our research is that our research protocol timeline did not allow for much design process iterations. Future research could include more back and forth with the organizations to

successively develop the concepts.

As we have mentioned, the role of the researcher is highly relevant in action research because he is initiating a pattern of events. In other words, the content created would otherwise not happen without the researcher's active participation. Our action research protocol involved the main researcher playing a large role of influence in shaping the elements of the design approach. In this study, the researcher played both the role of a facilitator with engaged participants and an external designer building from his own experience and imagination. We discussed previously in the methods section the role of the researcher and how we took into account that influence first through transparency and second by referring and grounding in existing research literature. By changing the researcher, additional studies could reaffirm our approach and better assess the influence of the researcher in the process. In addition, the will, openness and creativity of participating companies also influences our capacity to determine the relationships between the design process and the resulting artifacts. Then again, the goal of the dual process was to surmount the potential lack of direction by the participants by adding a complimentary design thinking process.

Research limits become opportunities for future research. Although we did not asses quantitatively the economic, environmental and social impacts of our concepts, future research could go one step further and measure the sustainability of business models with life cycle assessments. Nonetheless, we created concepts that can be used with other organizations to demonstrate the potential of foresight and advanced design when it comes to imagining more sustainable business models.

5.6 Conclusion of the discussion

This research has for objective to demonstrate how a design approach can be used to imagine more sustainable business models. We revisit the conceptual framework presented in chapter 2 by discussing the benefits and limits of each proposal. This fifth chapter first reviews each of the three elements individually. At each step of the way, we expose the insights from our experience and our participant's feedback. Then we join the three elements together to see what each brings to the table. For example, we find that our design tools provide new forms of analysis in vertical and horizontal coherence. They also serve three purposes of representation, generation and validation. In terms of the design process, we find that a dual design process of co-creation and design thinking build on each other's strengths. Co-creation ensured stakeholder engagement and better awareness of the problem situation where as design thinking led to further projecting and learning opportunities. We have found that design outcomes can be interpreted as a working memory, reinforcing imagery and mental synthesis. By putting all three elements together as a design approach to envision more sustainable business models, we find that tools structure knowledge, process builds on experience and outcomes return direction.

Based on our empirical fieldwork, we affirm that our design approach to sustainable business models, as a whole, works towards changing perceptions and serves as an ideal when working towards the future of the organization. Moreover, we have experience how this design approach constitutes the means to initiate change in organizations by providing a positive vision of what a sustainable business model can be.

To put things in perspective, we then talked about the transferability of our research to more general cases of business model innovation, as we set it specifically for more sustainable business models.

Finally, we shared the limits we perceived in this research which were related to the focus on the creative phase, the single iteration of the dual design process, the influence of the researcher and the qualitative approach. We now move to conclude our research by discussing how it fits with the current context of research, practice and sustainability.

Chapter 6. Conclusion

To conclude we expand on how our research fits into the greater context we have portrayed in this research. First, we begin at the meso scale by illustrating the evolution of the three fields of research and a few relevant dimensions implicated in the design of sustainable business models and we end up with a broader view of how theses fields and dimensions converge. Second, we dive into the micro scale to translate our research findings for the advancement of three actors whose practices are aligned with each fields of research. Third, we zoom out at a macro scale to conclude with an even broader view on the transformation of the industrial paradigm towards sustainability.

6.1 The convergence towards the design of sustainable business models

We now attempt to synthesize our point of view in relationship with the context of our research by illustrating the evolution of the fields of this research. In the following figure 22, we take a step back and attempt to chart the evolution of the fields of research and assess the progress of a few dimensions we have referred to in this research. We started by retracing the convergence of management and design. As illustrated previously in figure 5, new product development lines up with product design, service science with service design and business model innovation with design thinking. We then plotted research on organizational sustainability as moving from eco-efficiency to product-service systems and now sustainable business models as presented in our introduction. Theses main research fields are named in bold letters.

In between these three fields of research, we aggregated other dimensions we have studied during this research and then we aligned the progress or hierarchic levels of these dimensions. We placed Findeli and Bousbaci's (2005) works on the eclipse of the object and the philosophical progression from

aesthetics, logics and ethics levels. We then add Anthony's (1965) three levels of organizational decisions from operational to tactical and strategic which we had previously aligned with our design outcomes of product functions, service scenarios and business model concepts from Figure 21. We could have added Buchanan's 4 orders of design or Nidumolu et al's 5 sustainability levels in organizations, or Brezet's 4 levels of sustainability, but those three concepts are quite similar to the progression of each of our fields of research.

By lining up the three successions of focus in design, management and sustainability research, we arrive at the conclusion that there is a similar progression over time. By adding the other dimensions, the philosophical, organizational and design levels of thinking, we are able to draw parallels and find a repeating pattern pointing towards abstraction. The complete diagram could be interpreted as pointing towards a form of intangibility or even immateriality. This fits well with the concepts we have elaborated while searching for a means to design sustainable business models. For example, we conceived value propositions of energy provision by Rainpipe, a furniture leasing service direct to end-user for Offurniture and a logistics database for PaperLam.

The resulting illustration allows to interpret a common progress. We believe that the progression that characterizes theses fields is similar enough to envision that if ever a new level emerges in one stream we could project its presence in the other fields. This diagram should prove to be a useful construct for all fields and their theories involved in better understanding the design of sustainable business models.

Levels towards the Design of Sustainable Business Models

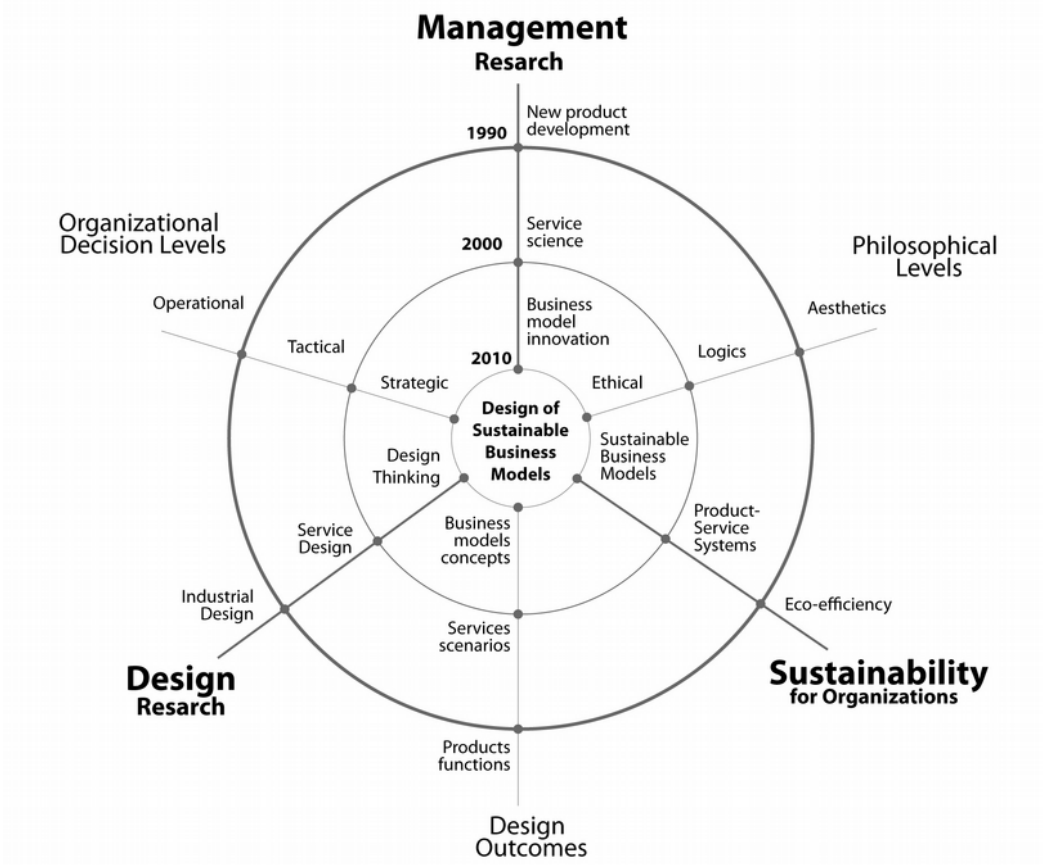

Figure 22. To our three fields of research, we aggregated other dimensions that we have studied and aligned the levels each subject. The conclusion is an illustration of the common progress.

6.2 A design approach for practitioners

As a the field of design research converges with the field of management, it is time for its actors to take on the challenge of sustainability in organizations. To better orient this discussion, we shift our focus from the theoretical constructs of the research fields to the professionals implicated in all three fields

mentioned. We consider how our design approach could effect the actors and their practice in the field. In other words, we come full circle, back to our introduction, in order to answer to the researchers and practitioners who were calling for a design approach to sustainable business models. In the following section, we disucuss the potential of our design approach to business models for sustainability by exploring the influence it can have on professional designers, managers and sustainability experts. Our goal here is to provide a few thoughts how the design approach can serve different practitioners, and more importantly how our three design elements cover their blind spots. In our opinion, some early manifestations for this practice is already underway.

6.2.1 For designers

We have previously cited researchers (Buchanan, 2007; Manzini and Vezzoli, 2003) and practitioners (Brown, 2009; Esslinger, 2011; IDSA, 2011) who declare that design practice can serve beyond physical products towards intangible management challenges. The role of the designer can be played at all four levels of the orders of design described by Buchanan's. With respect to sustainable business models, we emphasize role of the designer to rethink the way an organization creates value. Our research has shown that there is a place for **creativity** when projecting organizations into the future with three types of outcomes: sustainable business models concepts, service scenarios and product designs. For example, who would have thought that a cream manufacturer could have its users customize their own formulations in reusable packagings? Or that a bath manufacturer could offer a complete water management system for all washing and drying needs. However, this pertinent creativity by the external designer would not have been possible without the situated awareness provided by participation of the stakeholders in the co-creation phase of the design approach. This learning point resonates with Manzini and Vezzoli (2003) when they explored everyday sustainable scenarios that led to the creation of

concepts of product-service systems. Through their research, they learned that *"introducing systems innovation within design for sustainability requires new skills. First, it means that we have to learn to design integrated products and services. This brings up the issue that is relatively new in current design practice and requires designers to learn how to design the stakeholder configuration, in order to find solutions that might combine the economic and environmental interests." (Manzini and Vezzoli, 2003, p.212)* Because of this world-view on the situation, it is a design team, not a single designer, that is empowered to better insure the creation, delivery and capture of value that their business model produces.

Our action research protocol enabled for a design approach to guide multi-functional teams in co-creating more sustainable business models. Our tools, process and outcomes did not exclude human qualities that characterize a design practice, such as **instinct** and sensitivity. In fact, we find that our purposeful design approach provides a common structure for other types of qualities to emerge. Thus, we suggest for professional designers to actively invite other stakeholders to join them in the process of design. For example, there are some quantitative aspects to designing a business model that are not part of a conventional designer's practice. In our field work projecting the costs and revenues or figuring out the financial model was naturally driven by managers. Calculating the environmental impacts naturally interested the sustainability experts. In contrast, designers have **qualitative** strengths (Hollins, 1995), which allow them to be comfortable with ambiguity and open-ended outcomes that are generated in a foresight process.

Quantitative versus qualitative perspectives is but one example of why a design approach should be undertaken by a team of various functional training. This implies collaborating with company executives,

engineers, marketers but also working in conjunction with potential clients and end-users. Another argument for a multifunctional design team is timing. The designer's skills are often rooted early in the exploration phase. After which there are other disciplines or practices that can play a larger role for the implementation phase of a project.

In summary, our research artifacts embody the creative instincts of designers within our design approach. As we have experienced in our protocol, we also suggest for designers to use the tools, process and outcomes to educate participating stakeholders while inviting them to co-create more sustainable futures. We now continue to discuss the impact of our research on another practitioner: the organizational managers.

6.2.2 For managers

At the start of this dissertation, we introduced the field of management research by retracing the evolution of efficiency in the industrial and product development processes, then the broader view of service and finally business model innovation. This mirrors our findings when we adapted our outcomes to the three level pyramid of management arriving at strategic business models, then tactical services and functional products. This can also relate to the 5 levels of integrating sustainability in organizations by Nidumolu et al's. We continue to see our design approach as a means for managers to elevate the sustainable innovation maturity of their organizations out of their 3rd level of product and services design to the 4th level of developing sustainable business models. Againl, the authors describe this 4th level with convincing examples, but they did not expose a means for managers to get there. Here are three elements of how our design approach connects with managers in developing sustainable business models.

First, the managers in our study were very aware of the situation their product positioning in the market, their organizational strengths and environmental challenges. This **situation awareness** became evident with the speed with which they were able to use our triple layered business model tools to illustrate their current business model. Their active participation and capacity to share their current problem situation greatly benefits the design process. This relates to what we found in the design process when we justified the addition of a design thinking process to the co-creation process. Notwithstanding, our design approach does benefit greatly from the situation awareness of managers to insure relevance.

Second, during the co-creation process we remarked how some managers held a **short term focus** even though we were in a long term foresight exercise. Projecting a far reaching concept of a sustainable business model was difficult as they seemed bounded by their current market rationality. Their perspective contrasted with our tools, process and outcomes that were built for imagining a future business model because our design approach is devoted to the exploration phase. Take into consideration the thoughts of production director at PaperLam who expressed the following with regards to the long term focus: “I believe that [the foresight design concepts] opened our eyes to the importance of seeing the future. We are too often in the 'day to day', and we do not take time to see the future and this can be detrimental to a company ”. These thoughts reflects what we noted earlier from the feedback of the R-D director of Philips when speaking to the rate of change. Based on the participant feedback we gathered, we argue that our design approach has the potential to guide managers beyond their initial short term focus by creating a new space for exploration in the long term.

Third, we mentioned of how design thinking attempts to counter the natural inclination of managers to be **averse to failures**. Our research adds evidence that manufacturers concentrate on potential financial cost and returns in early stages of innovating business models (Ryan et al., 2011). Yet this goal

contradicts the difficulty to calculate the financial returns of new business models in the early stages of the development process. Our foresight workshops were orchestrated to create a space and time for bold ideas and allows the participants to purposely challenge current paradigms. Therefore the outcomes of our design approach are not to be measured with the same indicators as the outcomes of a conventional product design process such as the financial return on investment. What is more, our three levels of design thinking outcomes diverged from preoccupations about failure. Our outcomes have proved useful to the managers as an eye-opener, as a direction to build new concepts and as a basis for comparing future ideas. For example, we can look to how RainPipe's marketing director reacts to our business model concepts. She states: " *When we look at the business model of the future concretely, it seems little realistic but... it is inspiring to help us get out of our world when we imagine the future. It breaks barriers and allows us to dream.*". Moreover, we revealed in the discussion chapter how our design outcomes enable a mental synthesis, imagery reinterpretation and a working memory. These three characteristics of outcomes first help managers step back to see the bigger picture and second they can refine the design outcomes into projects. Again, we turn to Rainpipe's marketing director: *"The model was useful for us to reflect on our situation. We undertook a process of in parallel with an external agency and with these two exercises we have improved our company vision. With limited means we will try to take the lead in our market ... and have a long-term vision more aligned with future generations."*

Initially, we oriented our research for managers of existing organizations. With time and repetition, we perceived an opportunity to orient our design approach to sustainable business models for another public: start-ups and entrepreneurs. This comes from our experience facilitating workshops with enterprising students and university incubators. First and foremost, the timing and the means of entrepreneurs and starts-ups aligns with the explorative phase of a business model design. These

participants were very vocal in recognizing the pertinence of our design approach. They related to us how they experienced a strong sense of guidance from the structure of the tools. They planned to use the outcomes of our workshops to share the vision of what their business could be. And anecdotally, some participants of a younger generation were avid to beginning with the social and environmental aspects of their business model before figuring out the economic aspects of the model.

In conclusion, managers and entrepreneurs are well served by our design approach because their participation contributes to establishing a problem context before inviting them into an exploration space where they can embrace how the elements of a design approach favours improvement and learning through iteration. All three managerial aspects we described here feed into a larger problem of organizations big and small. Too little effort is put on the initial research phase of product development (Rae, 2007). Evidence for this shortcoming can be seen from market research that makes for only 12% of the expenses in developing a new product or service (Hollins and Hollins, 2006). Injecting a little more time and money in the exploratory phase could allow for managers to better discern needs, frame the problem and develop stronger concepts therefore increasing the potential for future success. Next, we look how our design approach can serve sustainability experts.

6.2.3 For sustainability experts

Another call for a design approach to sustainable business models came from the sustainability experts that dreamed of product-service systems (Cedergren et al., 2013; Mont and Tukker, 2006; Thompson et al., 2011). These authors, like many others the field (Cucuzzella, 2009), invoke a system's perspective as a gateway to more sustainability. To further the application of our design approach by sustainability experts, we see three parallels that all relate to a system's perspective.

First of all, approaching organizations from the strategic business model level is inherently a systems perspective (Zott and Amit, 2010). Thus our design approach in general can be considered as an example of the movement from a linear product focus towards a larger system's perspective for business models. We see a parallel with the boundaries of organizations slowly expanding past environmental concerns into social issues and even individual well-being. Madge (1997) goes further by affirming: "*The concept of sustainable design, however, is much more complex and moves the interface of design outward to societal conditions, development and ethics. This suggests changes in design and the role of design, including an inevitable move from a product to a systems based approach, from hardware to software, from ownership to service and will involve concepts such as dematerialization and a general shift from physiological to psychological needs.*" (p.52). From our field research, we witnessed how our design approach followed similar ambitions as described by Madge. To give an example, the Offurniture business model was based on offering employees the freedom to choose their furniture adapted to their individual needs within a leasing contract to take back the products at the end of the sales cycle. These types of system **innovations** resonate with Brezet's (1997) 4th levels of sustainability we presented in the introduction. Our approach naturally fits with current practices by sustainability experts in the way they apply their system's perspective as well as with their quantitative life cycle assessment tools thus making sure the concepts are in fact far more beneficial in economic, environmental and social terms.

Secondly, we remarked earlier how sustainability experts studying product-service systems prefer to emphasize the environmental and social benefits over demonstrating the economical successes (Baines et al. 2007). Our design approach not only allows for taking into account environmental and social impacts, but also links these aspects with the economical aspects for example when analyzing for vertical coherence amongst the three layers. For example in the Offurniture case, the service establishes

a social benefit of answering the end-user's needs directly with products that can be remanufactured in as an environmental strategy while taking part in an economic mechanism such as a yearly budget and a leasing program. This preoccupation for a triple bottom line helps sustainability experts avoid a blindspot by integrating economic measures at the origin of the concept. In all, our triple layered canvas tool represents a system that can portray the sum of triple bottom line relationships horizontally and vertically. For sustainability experts, this means **new forms of analysis** and a deeper understanding of the dynamics at play in all three layers of the business model as a whole.

Third, characteristics such as dialogical, recursive and hologrammatical are present in **complex systems** according to Morin (1990). This is important because a complex systems' perspective can broaden the understanding of the problematic situation and characterize the limits of the parts in the system. Both will provide nuances for success or failure of the design outcome. The same is argued by Cucuzzella (2009) within the context of sustainable design: "*By adopting an evaluation method that can deal with this complexity, some [sustainability] issues that continue to remain unresolved, may be better comprehended. In fact, this meta point of view may allow a better comprehension of the origin of the divergent positions. This is why an approach that can adopt a complex method for evaluation and innovation seems promising for designers in a context of sustainable design*."(p.288) We see our design outcomes as a means of evaluation in that they can serve as a reference point in current understanding.

In some cases, the outcomes can represent a dialogical opposition to what is considered the norm. For example, the Maverick hygiene system pushes the boundaries of what can be understood as a bath as it can become invisible by tucking it into the flooring. Moreover, the synthesis that embody the outcomes of design come from recursive improvements upon ideas. In all, we foresee sustainability experts apply

our design approach as a means to foster a complex systems perspective in order to evaluate the dynamics of business models rendering it sustainable over time.

Synthesis of the relationships of a design approach to practitioners

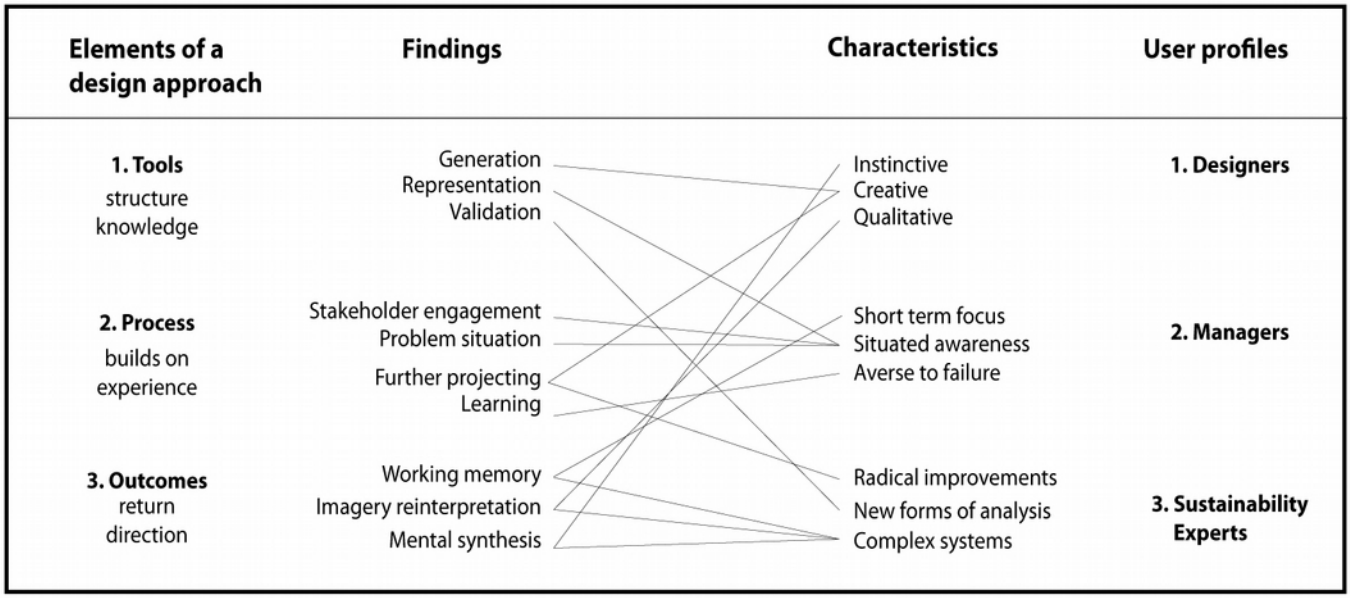

Table 13. This table illustrates how the insights of our design approach and our findings relate to the characteristics of three practitioners.

In the previous table 13, we illustrate how the insights of our design approach and our findings relate to the characteristics of three practitioners. In short, our design approach speaks to the creativity and instinctual qualities of designers. Second, it helps managers see past the short term, build situated awareness and embrace the exploration phase past an aversion to failure. Third, our design approach empowers sustainability experts to imagine sustainable business models with radical improvements, with new forms of analysis and with a complex system's perspective.

6.3 General conclusion

Although design is not a suitable approach for all types of organizational challenges, it can bear fruit in initiating a dynamic self-renewal of their business model. Introducing change is difficult to manage but it starts with designing a vision. We have just began researching how to design new business models with sustainability as an objectives and the subsequent transformation is an uncertain endeavour for any organization. Machiavelli said it best: "*There is nothing more difficult to take in hand, more perilous to conduct, or more uncertain in its success, than to take the lead in the introduction of a new order of things*" (1515).

From our findings, we suggest using the strengths of a design approach to purposely reinvent models for organizations to thrive economically while simultaneously improving environmental and social benefits. In some avant-garde organizations, a transformation process towards implementing a sustainable business model is already underway, though sometimes tacitly. If such a transformation begins early enough in organizations, they might reinvent themselves in time before extinction. That was the case at Patagonia in the 70s, IBM in the 80s and Xerox in the 90s.

More recently, we look to start-ups as they play a role in disrupting the existing business models of industry leaders. In Montreal, a new taxi service, operating under the name Teo Taxi, is a fine example of a more sustainable business model. This organization was designed to foster coherent relationships in the three layers of their business model. First for the socio-economic relationships, the taxi drivers are paid a decent living wage and inversely they are expected to deliver a high quality customer service. The company owns the costly taxi licences so the drivers do not have to invest large sums of their own

savings. The drivers do not own or have to take care for the maintenance of the cars. That's because the company owns the vehicle fleet. Second for the economic and environmental relationships, the exclusively electric energy propelled cars provide not only a reduction in green house gas emission, they enable to save on operation costs and maintenance costs. For the socio-environmental relationships the drivers are taught eco-driving techniques. Also, the way for clients to hail a cab is through an online application which enables the user to choose with regards to the closest located driver or according to special needs such as carrying capacity or drivers with higher quality service ratings. Just recently, the financial holding behind Teo Taxi bought a traditional taxi incumbent with the ambition to change the industry entirely. This is an example of how desiging business models to be more sustainable can have an impact on industries and eventually society.

Today we bear witness to the need for organizations to imagine far ahead into the future, past the solemn goal of harvesting profits. Of course, businesses need to continue reaping financial benefits in order to live on. Some pioneers choose to sow multiple types of benefits by creating a shared social and environmental value. We hope to have shed some light on the means by which of organizations can design sustainability into their business model with tools, process and outcomes. We have also seen the benefits of a design approach to business models from the point of views of designers, managers and sustainability experts. Design should be an inclusive practice, open to all that wish to move from existing situations to preferred ones.

This research leads us to believe that it is not just individual organizations that could benefit from using a design approach to continuously envision future business models, it is our industrial system and our society it serves. The end goal of our research efforts is to help build the methods to transition past the

20th century's capitalism based on industrial production and consumption. We seek to learn more about how a design approach can guide organizations evolve into a sustainable paradigm of society (Jackson, 2009). Again, if such a transformation is put off, organizations will fight for survival, and so will society as a whole. But if organizations undertake a design approach that entails a process, tools and outcomes, they should be able to envision how to renew themselves for greater sustainability. Then, we will all flourish into the 21st century.

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Annex 1. Article publication process

(as of April 2016)

Article 1: Design Tool

Past developments:
The triple layered business model canvas tool was reviewed and accepted and presented at the Artem conference in Nancy, France in March 26-27th 2015 with Raymond Paquin and Yves Pigneur as co-authors.

Current status:
The article was then edited and improved with Raymond Paquin's experience. It is currently under review at the Journal of Cleaner Production for the special edition on Organizational Creativity for Sustainability.

Citation:
Joyce, A., Paquin, R., & Pigneur, Y. (2015). The triple layered business model canvas: a tool to design for more sustainable business models. ARTEM Organizational Creativity International Conference. Nancy, France.

Article 2: Design Process

Past developments:
The article has been reviewed and accepted for the Mass Customization, Personalization and Co-creation conference (MCPC) taking place at UQAM in Montreal.
The conference presentation took place on October 20-22th, 2015.

Current Status:
The article has been accepted for the Springer series entitled the Lecture Notes in Business and Economics.

Citation:
Joyce, A. (2015). *"Co-creation and design thinking to envision more sustainable business models"*. Managing Complexity – Proceedings of the MCPC 2015, 8th world conference on Mass Customization, Personalization and Co-creation Conference. Montréal, Canada.

Article 3: Design Outcomes

Past developments:
Accepted for the Network Business Sustainability NBS conference on sustainability for SMEs in Montreal.
The conference presentation will took place on October 28-30th, 2015.

Current Status:
The paper will be submitted to the Canadian Journal of Administrative Sciences (CJAS) before June 1st.

Citation:
Joyce, A. (2015). *"Designing more sustainable business models, services and products: How design foresight outcomes can guide organizational sustainability of SME manufacturers."* NBS International Conference Sustainability: Developing Solutions for SMEs. Montréal, Canada.

Annex 2. Design researcher's Biography and CV

Alexandre Joyce, B.D.I., M.Sc.A, ADIQ, NPDP

Since 2008, Alexandre Joyce has been working as an advisor in sustainable product design for the Institute for product development (IDP) whose members are the leaders of the Quebec manufacturing industry. He works in concert with higher management to integrate sustainability in their business strategy and with innovation teams to include environmental criteria in the design phase. His experience in the field enabled him to publish a chapter on ecodesign methods in the guide book for sustainability managers that accompanied the BNQ norm 21000.

Before being a part of the IDP team, Alexandre completed a master's degree in Design and Complexity where he conducted research in eco-design with the Metamorphose and Metacycle groups to give a second life to everyday objects with rapid prototyping. It was in Milan with the international design firm TotalTools that he researched and developed sustainable product scenarios for multinational clients like IKEA, 3M and Autogrill. In 2009, Alexandre became a member of the (PDMA) which awarded him the title New Product Development professional (NPDP). Today, Alexandre Joyce is an active figure in community as a member of the Board of directors of the consumer advocate non profit called Option-Consommateurs.

Alexandre JOYCE, B.D.I., M.Sc.A., ADIQ, NPDP

Summary

PhD candidate with a Masters in applied sciences. An industrial design professional with 6 years of experience in advising manufacturing companies relating to innovation practices such as sustainable product design. Specializing in the integration of sustainability in business models and consumer scenarios. Known for his curiosity, his networking skills and his creativity. Fluent in French, English, Spanish and Italian.

Education

PhD candidate Individualized Program (multidisciplinary) – Concordia University **2012 –** *to date*
Masters in Applied Sciences, Design and complexity program – Université de Montréal **2006-2008**
Bachelor degree in Industrial Design – Université de Montréal **2002-2006**
DEC Pure and applied sciences – Collège Jean-de-Brébeuf **1998-2000**

Certifications and Professional training

Corporate directors of the future - Collège des Administrateurs et RJCCQ **2014**
Global Leader Experience Program - Common Purpose **2014**
"New Product Development Professional" Certification and training - PDMA **2010**

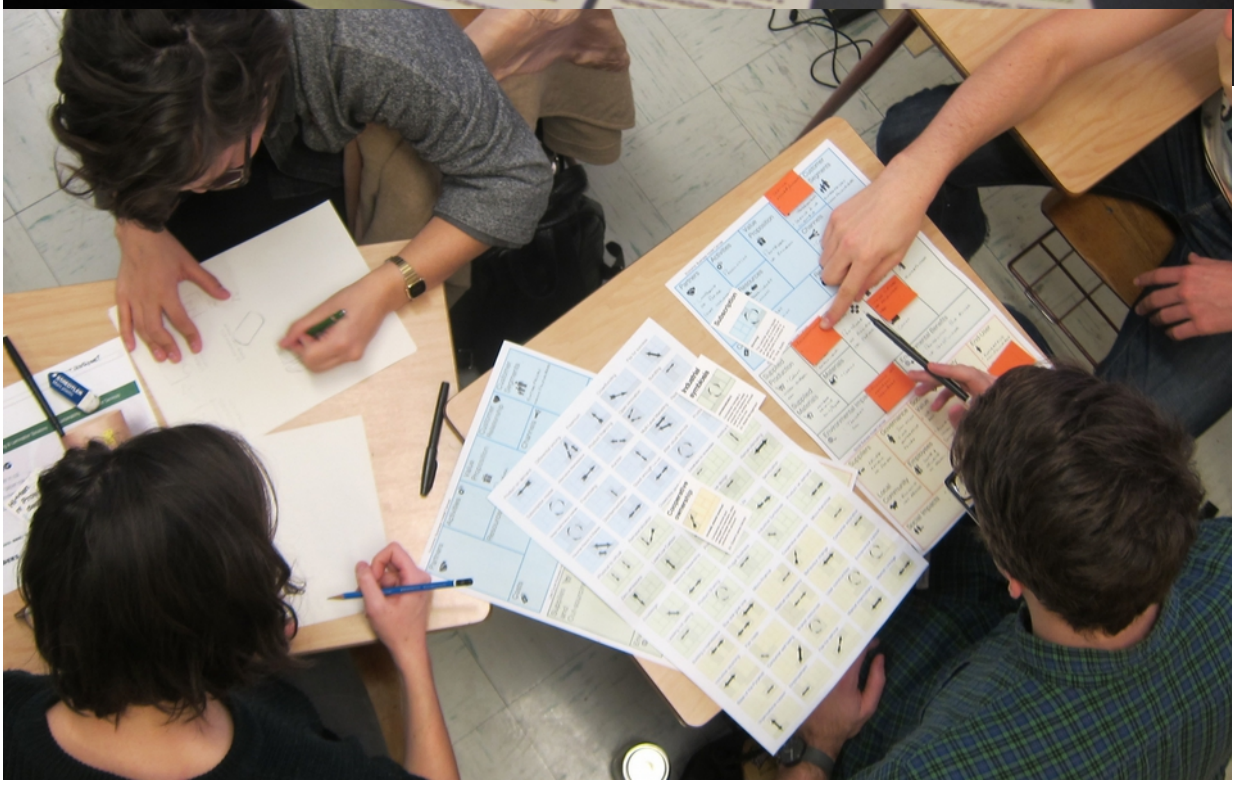
Work experience

Institut de développement de produits (IDP) - *Senior advisor in ecodesign* **2008 –** *to date*
Université de Montréal - *Lecturer Rapid Prototyping class* **2008 –** *to date*
Université de Sherbrooke - *Lecturer in Product development strategy* **2012-2013**
Hexagram research center - Metamorphose, Metacycle, DNA research projects **2004 - 2015**
Total Tool Milan - *Industrial Designer* **2007**
Brain Bank Inc - *Industrial Designer* **2006**

Professional and Social Involvement

Board of Administration (VP) – Option Consommateurs- Consumer association 2013 – *to date*
Board of Administration – Association des Designers Industriels du Québec (ADIQ) 2009 - 2013
Table de consultation – Mission Design, Economic sectors panel 2010 - 2012
Jury Grands Prix du Design – Magazine Intérieur 2012
Translation committee – OKALA Ecodesign guide - St-Étienne Chamber of Commerce 2011
Moderator of the event «Building Bridges» – Design Research Society Conference 2010
Board of Administration – Materials for the Arts 2009
Jury Eco Durable Production Contest – City of Montreal 2008
President and member of the board of administration – Industrial design student ass. 2002 - 2006

Annex 3. Examples of workshops




Encourage sufficiency
(slow consumption, long life)
Solutions that actively seek to reduce consumption and production.